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This Week

A survey of the 1937 cars by P. M. Heldt begins on page 710 of this issue.

Beginning on page 723 are five pages of specifications of the new cars. Read them both carefully. They are enlightening and give a broad picture of what has happened in the field of automotive design for the new models, with more to follow next week.

If you want to broaden it out still further turn to page 715 where you will find all of the new cars arranged by price with make and model designated.

The State Motor Vehicle Administrators held their annual association meeting and the subject of regulating the operation of coach trailers come in for a lot of discussion. On page 720 you will find an account of the whole interesting procedure.

Sales Outstrip Production

December Schedules Stepped Up to 500,000 To Care for Show-Stimulated Buyer Demand

By Harold E. Gronseth

During the coming week, the automobile industry's production for 1936 will cross the 4,000,000-unit mark and very early in December it will pass the entire 1935 output of 4,119,811 cars and trucks. This is just about a month earlier than the 4,000,000 mark was reached last year. The factories are now turning out new models at the rate of 16,000 a day or 400,000 a month, and are headed for a daily rate of 20,000 units, or 500,000 vehicles in December. Most of the assembly lines are running six days a week.

With demand stimulated by the new models and automobile shows in leading cities throughout the country, buyers are taking cars as fast as they can be built. In fact, orders are coming in faster than cars are going out and there is talk of a car shortage for some time ahead. Dealers tell of impatient buyers switching from their first choice to cars on which earlier delivery can be had. With production flowing speedily into the hands of buyers, dealers are finding difficulty maintaining in display stocks despite steadily expanding output of the factories.

The industry's executives are more than ever convinced of the conservatism of their forecast for an overall increase in business of 10 per cent next year. The auspicious start made by the 1937 model year is all that they hoped for and even more. As one official put it: "All signs in the air are good and the selling being done at the shows seems to bear out our optimism." Another pointed out that the wage increases, workers bonuses and heavy dividend disbursements being made, together with increased employment, all mean more money in circulation, more business for everyone, and specifically a sustained heavy demand for automobiles. There is still a shortage from the depression years to be made up.

It is clear even to the layman that reports from the automobile shows spell bigger business for the industry. During the recent lean years, reports from the shows dealt mostly with atten-

(*Turn to page 707, please*)

Sit-Down Brings Bendix Closing

Management's Resolve to Fight Union Move for Closed Shop Ousts 4000 from Plant

Officials of the Bendix Products Corp. and representatives of the United Automobile Workers local were still in session late this week endeavoring to end the deadlock which closed the company's South Bend plant and threw 4000 men out of work Nov. 17. Closing of the plant came when union workers staged a sit-down strike in protest against the presence of non-union men in the plant. J. P. Mahoney, vice-president and works manager, then issued an order for all workmen to turn in their tools and leave the factory.

Vincent Bendix, president, and John Mahoney, vice-president of the corporation are holding the discussions with seven members of the union. According to Mr. Bendix, there are 500 union employees who have refused to leave the factory buildings. The union claims there are 1200 holding the fort inside the gates. Food has been passed in to those inside. The union demands a complete unionization of the plant and the abandonment of the Bendix Employees' Association which they claim is a company union. Bendix said in an interview: "We will never agree to a complete organization of the plant, we cannot operate as a closed shop." The union claims that no strike exists but that the employees have been locked out. This, they claim, is a strong point in their favor.

Adolph Germer, field representative, and Leo Krzycki, field director, of the Committee for Industrial Organization, are in South Bend. Both have been active in the organization of the United Automobile Workers of America union.

Mr. Mahoney has circulated a letter among the workers which calls attention to the fact that the men and women are illegally occupying the plant and the company would not ask or demand that any employee join, or refrain from joining, any union. Those in the plant have music and cards, food, clothing and tobacco which have been passed in and the workers are per-

(*Turn to page 706, please*)

Fuel Injector for Air Engines Approved by Commerce Dept.

The Department of Commerce has issued ATC certificate No. 168 approving the use of the Marvel fuel injection system in conjunction with the radial aircraft engine of Continental Motors Corp. Mechanical injection of the fuel does away with the carburetor and as applied to aircraft engines possesses the advantage that it eliminates the danger of carburetor icing in damp and chilly atmospheres. Besides, the delivery of fuel to the cylinders is not affected by the attitude of the aircraft in maneuvering.

At the Chicago automobile show, Al Faeh, general manager, presents the "American Bride," one of the participants in the colorful "Brides of the Nations" pageant.

Car Export Problems Discussed

Foreign Trade Convention at Chicago Hears Bauer of AMA and Dr. Pratt of Chrysler

The annual National Automobile Shows in New York were cited as examples of effective teamwork by the members of a single industry, embodying cooperation of both the domestic and export viewpoints, in an address by George F. Bauer, export manager of the Automobile Manufacturers Association before the National Foreign Trade Convention in Chicago, Nov. 18.

"The industry," he said, "has encouraged cooperative action not only in the domestic field but for the expansion of overseas markets as well. Its joint efforts in the promotion of overseas trade were undertaken on the assumption that the total amount of export business available to the manufacturers in one group is not limited but rather that it can be expanded collectively for the benefit of all.

"The principal objective in such work is to maintain consumer prices at a reasonable level on a world-wide basis and not let them be over-burdened with all kinds of unjustifiable charges. Consequently, in cooperation with the Bureau of Foreign and Domestic Commerce, the export committee of the association has encouraged the preparation of an Automotive Foreign Trade Manual which makes basic information on all overseas markets available for ready reference by export leaders of the industry," Mr. Bauer explained.

Business has a right to ask the Government for two aids to its export operations, declared Dr. E. E. Pratt, sales promotion manager of the Chrysler Corp., at the National Foreign Trade Convention. The two are relief from fluctuating exchanges and full publicity for American business methods in foreign markets.

The publicity should, he said, cover full and uncolored reports and information and should include technical reports on the conduct of business abroad. It should also provide for personal information service abroad such as economic and geographic market analysis.

Doctor Pratt said that American selling methods differ from those of most other nations and that our production methods are vastly different.

The speaker illustrated by remarking that we should not seek to alter existing physical or legal limitations abroad, such as traffic laws, but that where our methods represent a clear advance and result in a better product we should follow out our own developed procedure. Necessary to foreign sales will be full use of all available advertising media, he said. Service facilities abroad are also required, Doctor Pratt added.

Chevrolet Truck Power Increased

New Engine Rates 78 hp., Has Larger Bore, Shorter Stroke, with Four-Bearing Crankshaft

The Chevrolet Motor Co. has shown its 1937 line of trucks at the Newark Truck Show, the New York Automobile Show and at other shows. The powerplant of the new line is slightly larger than that of last year. The bore has been increase to 3½ in. and the stroke shortened to 3¾ in. These measurements give a piston displacement of 216.5 cu. in. against the previous displacement of 207 cu. in. The horsepower of the new engine is 78 at 3200 r.p.m. and the rated torque is 170 lb. ft. at 850 to 1550 r.p.m.

One of the chief features of the engine is the new crankshaft which has four main bearings and weighs 68 lb. Lubrication is by pressure to the main bearings, camshaft bearings and rocker arms and by pressure stream and dippers to the connecting rod bearings.

The clutch on the commercial car is a 9 in. single plate type while the clutch on the 1½-ton truck is of the same type and 10 in. in diameter. The full floating axle is continued on the 1½-ton truck. The sedan delivery and coupe pick-up jobs have the new hypoid axle, while the commercial car and the 1½-ton truck have a spiral bevel drive. The latter is a four-pinion straddle mounted pinion type of differential.

Wheelbase of the sedan delivery and coupe pick up is 112½ in. while the wheelbase on the commercial car is 112 in. and the truck is offered with 131½ in. and 157 in. wheelbases. All have hydraulic brakes and there are several tire options, including balloon tires.

Three speed gear boxes are fitted to the light jobs and a four speed gear box to the heavy truck. The final drive ratio on the 1½-ton truck is 5.43 or 6.17. All frames have been made stiffer. They have been increased in size and employ U channel cross members. An all steel cab is provided along with a variety of body styles.

Studebaker - Autocar Selling Agreement to Be Terminated

Termination of the merchandising contract between the Autocar Co., Ardmore, Pa., and the Studebaker Corp., South Bend, is scheduled definitely for the end of the year, according to reliable sources. Neither party to the contract would issue a statement.

The agreement between the two companies has been in effect since February, 1934. Studebaker trucks, heretofore, in tonnage classifications not covered by Autocar, have been sold through Autocar factory branches in metropolitan territories.

Solbelman photo

Henry Ford recently pointed out to visitors the desk where he carved his initials while learning his "three r's." The schoolhouse where the automobile manufacturer once studied is now in use by pupils of model Greenfield Village, near Dearborn, Mich.

Packard Lifts Pay

Increased Wages, Salaries to Cost Company $1,250,000 a Year

Pay increases for over 11,000 employees of Packard Motor Car Co. and totaling $1,250,000 a year became effective this week. Alvan Macauley, president, announced that an increase of 5 cents an hour has been granted to all hourly wage workers, numbering 10,579, and all salaried employees receiving less than $200 a month, a total of 511, were advanced $10 a month.

"We are all engaged in a mutual endeavor to create a greater success and more prosperity for the Packard organization," Mr. Macauley stated in a letter to employees. "The merit system will be continued. Under this, the promotion of both hourly rated and salaried employees will be dependent upon the merit of the individual and his value to the company."

The company's policy as to vacations with pay, separation and retirement pay will be continued during 1937.

International News photo

Chugging along Washington streets, ancient relics of the early automobile age paraded to open the city's annual automobile show. Philadelphia also held a rally of antiques in connection with its show.

October Car Sales 12% Above Year Ago

New passenger car sales reported in 22 states for the month of October total 51,849, the weekly survey of the R. L. Polk & Co. discloses. This is a percentage gain of 12.01 over the same month last year when 46,291 sales were recorded for the same number of states. The seasonal decline in sales from the month of September is minus 19.11 per cent since 64,097 sales were recorded in that month.

With these figures representing 31.19 per cent of the United States, the Polk estimate of sales in October has been placed at 168,000.

In truck and commercial car sales the total figure for 22 states is 13,747. Here again is a gain over the same period last year when 12,038 sales were recorded. The percentage increase is 14.20 for 32.15 per cent of the country.

October sales to date represent a minus 23.06 per cent compared to the 17,867 sales recorded for the same number of states during the month of September. The Polk estimate of truck and commercial car sales for October is 43,000.

Motor Union Drives for Members

Local Organizers, Aided by CIO Leaders, Claim Gain of 3000 During Past Three Weeks

The membership drive of the United Automobile Workers International Union, which was materially speeded up after the election, is bringing highly satisfactory results, according to Richard Frankenstein, chief organizer. About 3000 new members have been added and one new local formed during the past three weeks, he stated. From a membership standpoint, it was the most productive three-weeks period in the history of the union.

Impetus was given the drive in the Detroit area last week when efforts of local organizers were supplemented by the advice and assistance of leaders from the John L. Lewis Committee for Industrial Organization. Three mass meetings were held in separate industrial sections of the city. Principal speakers were Philip Murray of Pittsburgh, chairman of the steel workers' organization committee and vice-president of the United Mine Workers, and John Brophy, CIO director.

Speakers at a meeting in the Hotel Detroiter said that peaceful organization would be the keynote of their campaign and that a major effort would be made to harmonize the efforts of several independent unions with the CIO.

Success of the drive to date has encouraged the union to enlarge its staff of organizers now comprising five full-time workers in addition to the five international officers. It is planned to add four more organizers. During the past 10 weeks, the union has distributed 750,000 pieces of literature among automobile workers in Michigan plants.

Wage negotiations are under way in two plants, one that of a car manufacturer and the other a parts producer. Frankenstein reported that good progress was being made in the negotiations and that agreements probably would be reached by the end of the week.

With the assistance of CIO representatives, executive officers of the union drew up the following eight point program:

1. Establishment of an annual wage to assure security during periods of idleness, to protect the workers and their dependents and to provide a standard of health, decency and comfort.
2. Elimination of the speed-up system.
3. Straight seniority rights to provide job security.
4. Immediate establishment of a 40-hour week and 8-hour day.
5. Time and one-half for all time worked over the basic work day and work week.
6. A permanent program of progressive reduction in hours until all workers who have been displaced by the introduction of machinery are reemployed.
7. Improved safety measures to protect the life, limb and health of the workers.
8. Establishment of true collective bargaining through representations of a bona fide labor organization.

Union officials are working out agreements with the various locals which will establish a basis for cooperation in the event any of them requires the assistance of other locals.

Edison Navy Official

Head of Thos. Edison, Inc., Named Assistant Secretary

Charles Edison, son of the late Thomas A. Edison and president of Thomas A. Edison, Inc., was appointed Assistant Secretary of the Navy on Nov. 17 by President Franklin D. Roosevelt.

Mr. Edison succeeds Henry L. Roosevelt who died last February. In his new post Mr. Edison will resume the close affiliation with naval affairs he had during World War years when his father was president of the Naval Consulting Board and President Roosevelt was Assistant Secretary of the Navy.

As the directing head of Thomas A. Edison, Inc., he has been active in automotive circles through the Emark Battery and Edison-Splitdorf Corp. divisions of the company. He has been an ardent supporter of the New Deal and has held important posts in NRA and FHA.

Shows Set Nation-Wide Records

More Buyers This Year, Say Salesmen in Many Cities; Trailer Coaches Prove New Attraction

While "the most successful national automobile show in history" was closing in New York this week, exhibits in the other leading cities of the country were also setting new records.

Chicago's show, with its spectacular "Brides of the Nations" pageant, was enjoying on its fourth day an attendance 40 per cent ahead of last year's. Tourist trailers, as in New York, were competing with passenger cars for visitors' attention. In Chicago, 25 trailer makers showed their products in the north wing of the International Stockyards amphitheater covering more than 30,000 sq. ft. of floor space.

In Philadelphia, several "firsts" combined to boost attendance at the 36th automobile show from 65 to 70 per cent above that of last year. It was the first show to run for eight consecutive days and the first to be open on Sunday. It was the first show to give away an automobile free each day. Each purchaser of a paid admission participated in the drawing held every evening to determine the winner of that day's car. On the closing night the eight cars were distributed by lot among the winners. Trailer coaches were exhibited at Philadelphia's show for the first time and for the first time in five years there was also an extensive truck display.

Detroit's show, too, was breaking records at the end of its fourth day. Visitors then totaled 79,683 compared with 58,763 for the same period last year. Sales crossed the million dollar mark on the fourth day, almost equaling the total for the entire show week in 1935. "Crowds are more in a buying mood than they have been in years," salesmen were saying. The 40,000 sq. ft. allotted to tourist trailer exhibits proved inadequate for the crowds that milled about the 32 models on the floor.

Toledo's 29th annual automobile show also reported record-breaking attendance. More than 10,000 visitors entered its doors on the first night. Local unveiling of the new Willys was the high spot that evening when Willys-Overland officials held a dinner for representative Toledo business men. Trailer coaches were, here, a new feature, too.

The nation's capital also profited from the rising tide of business. Washington's 17th annual automobile show attracted record crowds at Calvert Exhibit Hall. More diversified in interest than most other shows, it had exhibits of electric refrigerators and oil burners as well as automotive products. Trailer coaches were a new feature.

St. Louis also reported higher attendance and more business done in spite of picketing of the show by members of United Automobile Workers Local No. 25. Handbills distributed outside the Mart Building, scene of the show, charged the St. Louis Chevrolet plant with discharging union men because of their affiliation.

San Francisco's show laid claim to being the most diversified ever held in that city. There were more exhibits than ever before and visitors from all parts of the state set new attendance records. An unusually rich and varied entertainment program featured young Bobby Breen and many other radio and musical stars.

Edsel Ford, speaking at Detroit, said: "There is a different type of interest at all the shows this year—a more genuine enthusiasm."

Show visitors in all cities, according to Harry Moock of Plymouth, are meeting salesmen more than half way instead of backing away as they did in recent years. New cars are going directly into the hands of the public instead of into dealers' stocks, he added.

Byron C. Foy, DeSoto president, visiting the Detroit show said it was the most colorful he has seen and predicted that car makers would not be able to keep up with demand for 1937 models. "There aren't any spots in the country where business isn't good or doesn't look good," Foy added.

HUGH H. NICKERSON, vice-president, treasurer, and manager of Kabin Koach Co., East Detroit, Mich., has taken charge of production, and is installing an assembly line for Kabin Koaches at the new plant of the company at Pontiac. Mr. Nickerson was in charge of production of Hupmobile cars for 22 years, and general manager of the Murray Body Corp. of America for two years.

PAUL D. LORANGER, formerly parts and accessories merchandising manager in the Kansas City zone, has been appointed manager of the new retail parts and accessories department of the Chevrolet Motor Co.'s central office in Detroit.

E. J. COSFORD, formerly president of the Associated Equipment of Canada, has been appointed general manager of Mack Trucks of Canada, Ltd.

MAURICE R. HULL, an executive in the Milwaukee tractor works of the International Harvester Co., has been appointed general superintendent of the International tractor plant at Neuss, Germany.

Willys - Overland Stock Up 80% Since Issuance

In over-the-counter trading in Toledo, Willys-Overland Motors, Inc., stocks have scored important gains since the new car has been exhibited in New York and shows in other cities.

The market closed 11¾ bid, 12 asked, on preferred and 5¾ bid, 6 asked, on the common, Nov. 16, which shows an asking price of $18 for the units which were distributed originally for $10 a few weeks ago.

Ward M. Canaday, chairman of the board of the company, told Toledo business leaders that the company began its business only a few weeks ago with a plant having an asset value of $15,000,000 and only a few small current liabilities. The company emerged from court control with $3,325,000 in treasury, an inventory of $99,000, and liabilities of $75,000, covering various compensation claims not entirely adjudicated, and $30,000 of local taxes.

:SLANTS:

DWELLINGS—*Citizens of Orchard Lake, Mich., claim to be the first to make trailer dwellers realize there are such things as taxes. Justice of the Peace Arthur F. Green, after pondering the matter for a month, decided that a trailer is a human dwelling and not an automobile accessory. It is therefore subject to the village building ordinance and must have 500 cu. ft. per person living in it. With this means of prosecution opened up, tax-free trailer owners will be forced to park only on licensed properties where the charge of $100 an acre is expected to discourage them.*

PLANTS TO MUSIC—*Most modernistic of symphonies will be the accompaniment of the film showing the production of an American automobile to be presented in Washington, Nov. 23, as a feature of the Centennial Celebration of the American patent system. The hammering, welding, stamping and drilling noises of a modern automobile factory will be linked in a sound film to special music played by the nation's leading symphony orchestras. The picture, it is expected, will be sent on a nation-wide tour sponsored by the Junior Chamber of Commerce after its Washington showing.*

FRIDAY THE 13TH—*Old superstitions do not hold in air travel, it seems. On Friday, the 13th of November, 535 paying air passengers boarded transport planes at the Chicago municipal airport—said to be the largest number ever to fly away in one day from any airport. Previous record was claimed by Chicago last July 4 with 530 travelers.*

PROGRAM—*Interesting innovation at the New York show was the official program with its vivid history of the industry in the form of cartoons and illustrations from the magazine* Life. *Preceding the cartoon section was the list of exhibitors as well as a few pages of charts and data. The program was prepared and sponsored by the editors of* Time.

Carl W. Schelm
President of the National Coach Trailer Mfrs. Association, and of the Schelbro Trailer Co., Peoria, Ill.

Trailer Makers Meet

Dealers, Financing, and Legislation Discussed at Chicago

The "Brass Tacks Meeting" was the designation of the convention of the Trailer Coach Manufacturers Association held in Chicago in conjunction with the automobile show. More than 100 tourist trailer makers responded to the invitation issued by Carl W. Schelm, president of the association.

Among the subjects discussed were: sales financing, dealer organization, insurance legislation and safety.

An address on sales financing was given by John R. Walker, executive vice-president of the National Association of Sales Finance Companies. This association recently made a survey of the trailer situation, and Mr. Walker gave the manufacturers the results of that survey.

"Unless trailer manufacturers give immediate attention to the problem of building up their individual dealer organizations, concentrating on such dealers as have proved their abilities and responsibilities, they can never hope to reach the heights which they have set for themselves in the next year, two years and five years," said Don Blanchard, editor of *Automobile Trade Journal.*

Reporting the discussions relative to tourist trailers on the highways at the meeting of the American Association of Motor Vehicle Administrators, Lew Wallace, president of the American Association and director of Motor Vehicles for Iowa, warned the manufacturers of much bad legislation by radical elements in the several state legislatures that will convene in January. He said, however, that the association of motor vehicle administrators was opposed to such bad legislation and that the manufacturers association could be of great help by opposing this legislation in a united fashion.

Sidney J. Williams, director of the public safety division of the National Safety Council; J. Ross Moore, executive manager of the National Automobile Underwriters Association, and Carl R. Olson, vice-president in charge of operations of Keeshin Motor Express, Inc., were other speakers.

Motor Wheel Boosts Wages 5 Cents per Hour

An hourly wage increase for 2500 employees of the Motor Wheel Corp. was announced late Tuesday. Notices posted throughout the plant informed workers that an increase of five cents an hour in the wage rate of all employees will become effective Nov. 26. The wage increase at Motor Wheel follows a boost in the dividend rate for the final quarter of the year to 40 cents per share.

Nash-Kelvinator Merger To Be Voted on Dec. 23

Meetings of stockholders of Nash Motors Co. and Kelvinator Corp. to vote on merger of the two companies, were formally called for Dec. 23 at meetings of the boards of directors of the two companies held simultaneously in Chicago and Detroit Nov. 17. Stockholders of record at the close of business Nov. 27 will be entitled to vote. In order to be effective, the merger must be approved by the holders of not less than two-thirds of the stock of each company.

Finance Terms Easier

Trend Is to Longer Time, Smaller Down Payments, Says Banker

The effects of the trend to easier time payment terms on finance company operations were shown strikingly by Arthur W. Newton, vice-president of the First National Bank of Chicago, in an address before the third annual convention of the American Finance Conference held in Chicago this week.

Based on a consolidation of the operations of 20 finance companies, Mr. Newton presented the following comparisons: (first figure is of Dec. 31, 1935 and second figure of June 30, 1936) per cent of paper in portfolios maturing in 6 months, 62 and 57; per cent maturing in 12 months, 92 and 87; per cent maturing over 12 months, 7 and 13; repossessions, 1.57 and 1.81 per cent; per cent new car at retail to total, 66 and 55; new car paper over 18 months, 2 and 22 per cent; less than one-third down, 21 and 35 per cent. All foregoing figures refer to new cars.

Used car paper over 12 months, 21 and 36; per cent used car wholesale as per cent of total wholesale, 21 and 32.

Harvester Co. Appeals NLRB Order

"Company Union" Had Been Held Illegal Under Wagner Act and Ordered Dissolved

Following the order by the National Labor Relations Board Nov. 14 ordering the International Harvester Co. to dissolve its "industrial council plan," the company announced that it has appealed the case to the United States Court of Appeals in Chicago. The order was directed especially against the company's Fort Wayne, Ind., plant, but the board pointed out that the same plan exists in the 14 other plants of the company in the United States and Canada.

In a statement which the harvester company sent all its employees on Monday, it said: "The decision is of no effect until all questions of law and findings of fact have been reviewed by the Circuit Court of Appeals of the United States, and this court may affirm or reverse or modify the order."

Court decision in the case is awaited with unusual interest because of its importance in setting a precedent which would affect so-called company union plans generally. It is believed that the case ultimately will go to the Supreme Court of the United States unless in the meantime the Supreme Court should hold the Wagner Labor Act to be unconstitutional. Cases alleging unconstitutionality of the act are now before the court.

The Labor Board held that the Harvester Industrial Council plan at the Fort Wayne Works is an illegal labor organization under the terms of the National Labor Relations (Wagner) Act. The board found that the harvester company has financially supported the plan to an extent forbidden by the act "and that the management in other ways has extended its influence and support to the point of a supposedly independent worker organization."

That part of the order regarding financial support by the company is based on Par. 2 of Sec. 8 of the act. This section declares that it is an unfair labor practice "to dominate or interfere with the formation or administration of any labor organization or contribute financial or other support to it: Provided, That subject to rules and regulations made and published by the board pursuant to section 6 (a), an employer shall not be prohibited from permitting employees to confer with him during working hours without loss of time or pay."

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES

There was a moderate decline in general business activity last week. The weekly business index, compiled by the *Journal of Commerce*, stood at 100.7, as against 101.3 the week before and 83.0 in the corresponding period last year. Retail trade maintained the upward movement noticeable in October. Increases in department store sales were reported in all Federal Reserve districts last month, and sales for the country as a whole were 16 per cent above those a year ago.

Freight Traffic Steady

Railway freight loadings during the week ended Nov. 7 totaled 759,318 cars, which marks a decline of 54,857 cars below those in the preceding week, a gain of 104,357 cars above those a year ago, and an increase of 164,528 cars above those two years ago.

Food Costs Lower

Retail cost of food between Sept. 15 and Oct. 13 declined 1.8 per cent, according to the Bureau of Labor Statistics. The decline was chiefly due to the lower cost of such important foods as meat, butter, milk, and fresh vegetables. The current index of food costs is 82.8 per cent of the 1923-25 average, as compared with 79.1 per cent on Oct. 8, 1935.

Power Output Declines

Production of electricity by the electric light and power industry in the United States during the week ended Nov. 7 was moderately below that in the preceding week and was 13.4 per cent above that in the corresponding period last year.

Agricultural Imports Higher

A recent report, issued by the Bureau of Agricultural Economics discloses that imports of agricultural products during the year ended June 30, 1936, amounted to $1,140,000,000, which is only slightly more than half of the average for the five years ended June 1929. However, the latest figure shows a substantial increase above that for the preceding twelve-month period; and most of the expansion occurred in commodities that compete with the products of American farmers.

Fisher's Index

Professor Fisher's index of wholesale commodity prices for the week ended Nov. 14 stood at 85.3, as against 84.7 the week before and 84.5 two weeks before.

Federal Reserve Statement

The consolidated statement of the Federal Reserve banks for the week ended Nov. 10 showed no changes in holdings of discounted bills, bills bought in the open market, and government securities. Money in circulation increased $15,000,000, and the monetary gold stock rose $47,000,000.

Comfort Cushion Co. Formed in Detroit

The Comfort Cushion Co., with offices and factory at 5105 Loraine Street, Detroit, has been organized to produce custom made cushions for trailer coaches, trucks and automobiles. All work is under the personal supervision and direction of Adolph H. Lichter, who gained his early years of training in the Launer Carriage Works, in Vienna, Austria, and was later employed by Brewster & Co., makers of custom built bodies. When Chrysler began building bodies in 1925, Mr. Lichter was selected for the post of supervising body construction and developing all interior trim and upholstery. He was later with the Citroen Co. of Paris, France.

Dutch Firm Licensed to Make Hercules Diesels

Hercules Motors Corp. of Canton, Ohio, has announced the completion of a new and broader license agreement with N. V. Kromhout Motoren Fabriek of Amsterdam, Holland. For the past two years the company has enjoyed the exclusive distribution of Hercules gasoline engines and power units in Holland and the Dutch possessions, as well as the right to build gasoline engines under Hercules designs. Now this company has acquired, in addition, the exclusive right to manufacture as well as to distribute Hercules Diesel engines in Holland under Hercules patents.

The exclusive license for the manufacture as well as the sale of Hercules gasoline and Diesel engines in Holland does not in any way affect the rights of American manufacturers of powered equipment (and their representatives) who use Hercules engines, either gasoline or Diesel.

Motor Employment Up Sharply in September

The automobile and body industry reported for the month of September the highest accession rate of the 16 leading industries, according to the monthly report of the Bureau of Labor Statistics, Department of Labor. Variations in employment were much greater in automobile and body manufacturing plants than in those making parts and accessories. Compared with the preceding month, September reflected the resumption of production of new models with a sharp falling off in the separation rate and a big gain in the accession rate.

The following table gives detailed figures:

Monthly Turn-Over Rates (per 100 employees) in Specified Industries

Automobiles and Bodies

Class of Rates	Sept. 1936	Aug. 1936	Sept. 1935
Quit	1.24	0.99	0.76
Discharge	0.23	0.22	0.12
Lay-off	3.10	26.94	2.30
Total separation	4.57	28.15	3.18
Accession	20.35	4.30	10.49

Automobile Parts

	Sept. 1936	Aug. 1936	Sept. 1935
Quit	1.46	1.43	0.93
Discharge	0.39	0.36	0.20
Lay-off	3.36	3.85	2.09
Total separation	5.21	5.64	3.22
Accession	10.72	5.47	12.98

Swasey to Get Hoover Medal

The Hoover Gold Medal will be presented to Ambrose Swasey, chairman of the Warner & Swasey Co., Cleveland, and nationally known engineer at ceremonies in New York on Dec. 2. Mr. Swasey, for 67 years builder of precision instruments, will be honored at the annual meeting of the ASME at the Hotel Astor just three weeks before he celebrates his 90th birthday on Dec. 19.

40 Years Ago

with the ancestors of AUTOMOTIVE INDUSTRIES

Elwood Haynes, of Haynes & Apperson, Kokomo, Ind., has had a varied experience with gasoline motors for vehicle propulsion. Some two years ago, after carefully comparing the different motors, from a theoretical point of view, and deciding in favor of gasoline, he made an attempt to find in the market a suitable motor for the purpose. This proved to be a very difficult task, as at that time all the motors that could be purchased were too heavy and gave too much vibration. Finally, however, a motor was selected and purchased, but it gave such severe vibration when in motion that it was found necessary to built the carriage much heavier than at first intended, in order to provide for this. . . .

They have also built a second motor constructed on the same general plan as the first, except that the Otto cycle is used instead of the Clerk. It has two cylinders, gives an impulse at each revolution, weighs 340 lb., and develops 8 hp. . . . Their latest carriage carries six passengers. . . . Its speed has not yet been fully tested, but the builders believe it should run at least 20 m.p.h. on a good, level roadway.

—From *The Horseless Age*, November, 1896.

McAfee Named Chairman of AMA Motor Truck Committee

William F. McAfee, motor truck sales manager of International Harvester Co., has been appointed chairman of the motor truck committee of the Automobile Manufacturers Association to succeed the late Alfred J. Brosseau. New members appointed to the committee are W. E. Fish, manager of commercial car division, Chevrolet Motor Co., and David C. Fenner, vice-president of Mack-International Motor Truck Corp.

Mr. McAfee has long been identified with the association's motor truck committee, and in such capacity has been familiar with the numerous problems confronting users and manufacturers of the vehicles.

A 24 per cent increase in sales of motor trucks over last year was reported to the committee at its meeting at the association's New York headquarters Nov. 13. Based on returns for the first 10 months, it is estimated that 680,000 motor trucks will have been purchased in the United States by the end of the year.

Other members of the committee are Irving B. Babcock, president, General Motors Truck Corp.; Robert F. Black, president, the White Motor Co.; Joseph D. Burke, director of truck sales, Chrysler Corp.; Robert P. Page, Jr., the Autocar Co.; Elijah G. Poxson, president, Reo Sales Corp.; Martin L. Pulcher, president, Federal Motor Truck Co., and Arthur C. Butler, secretary of the committee.

Wide World photo

Mechanization of traffic counts, with speeding-up of applicable results, is foreshadowed in the development of a traffic counter employing an infra-red ray for actuation. Dr. Miller, director, Harvard Bureau of Street Traffic Research, explains the new device to Deputy Commissioner Harold Fowler, New York Police Dept., at Park Avenue and Fifty-eighth Street, New York City.

U. S. New Car Registrations and Estimated Dollar Volume by Retail Price Classes—September

	UNITS					ESTIMATED DOLLAR VOLUME*				
				Per Cent of Total					Per Cent of Total	
	1936	1935	Per Cent Change	1936	1935	1936	1935	Per Cent Change	1936	1935
Chevrolet, Ford and Plymouth	139,998	110,506	+ 26.7	67.14	70.35	$84,300,000	$66,100,000	+ 27.5	58.58	61.78
Others under $750	29,228	20,496	+ 42.6	14.02	13.05	21,000,000	14,400,000	+ 45.8	14.60	13.46
$751-$1000	28,303	19,703	+ 43.6	13.57	12.54	23,500,000	16,800,000	+ 39.9	16.33	15.70
$1001-$1500	9,294	5,191	+ 79.0	4.46	3.31	10,600,000	6,000,000	+ 76.7	7.37	5.61
$1501-$2000	633	47	+1247.	.30	.03	1,100,000	90,000	+1122.	.76	.08
$2001-$3000	537	779	— 31.0	.26	.50	1,400,000	2,200,000	— 36.4	.97	2.06
$3001 and over	524	349	+ 50.1	.25	.22	2,000,000	1,400,000	+ 42.9	1.39	1.31
Total	208,517	157,071	+ 32.7	100.00	100.00	$143,900,000	$106,990,000	+ 34.6	100.00	100.00
Miscellaneous	379	27	.....							
Total	208,896	157,098	+ 32.9							

U. S. New Car Registrations and Estimated Dollar Volume by Retail Price Classes—Nine Months

	UNITS					ESTIMATED DOLLAR VOLUME*				
				Per Cent of Total					Per Cent of Total	
	1936	1935	Per Cent Change	1936	1935	1936	1935	Per Cent Change	1936	1935
Chevrolet, Ford and Plymouth	1,750,053	1,481,316	+ 18.3	65.33	69.30	$1,055,400,000	$908,100,000	+ 16.2	57.10	61.72
Others under $750	387,743	303,758	+ 27.6	14.47	14.21	279,200,000	216,500,000	+ 28.9	15.11	14.72
$751-$1000	415,030	277,494	+ 49.5	15.49	12.98	345,600,000	235,000,000	+ 47.0	18.70	15.97
$1001-$1500	107,974	60,011	+ 79.9	4.03	2.81	123,500,000	70,700,000	+ 74.7	6.68	4.80
$1501-$2000	7,992	4,706	+ 69.8	.30	.22	13,900,000	7,990,000	+ 73.9	.75	.54
$2001-$3000	6,299	6,945	— 9.3	.24	.32	16,200,000	19,200,000	— 15.6	.88	1.30
$3001 and over	3,737	3,344	+ 11.7	.14	.16	14,500,000	14,000,000	+ 3.6	.78	.95
Total	2,678,828	2,137,574	+ 25.3	100.00	100.00	$1,848,300,000	$1,471,490,000	+ 25.6	100.00	100.00
Miscellaneous	3,555	510	.....							
Total	2,682,383	2,138,084								

* All calculations are based on list price F.O.B. factory of the five-passenger, four-door sedan in conjunction with actual new car registrations of each model. The total dollar volume for the different models is then consolidated by price classes.

October Rubber Consumption 18% Higher Than Year Ago

Consumption of crude rubber by manufacturers in the United States for the month of October is estimated at 49,509 long tons, compared with 46,330 long tons for September. October consumption shows an increase of 6.9 per cent over September and is 18 per cent above October a year ago, according to statistics released by the Rubber Manufacturers Association. Consumption for October, 1935, was 41,969 tons.

Imports of crude rubber for October are estimated at 40,920 long tons, a decrease of 15.4 per cent under the September figure of 48,386 long tons, but 19.1 per cent over the 34,356 long tons imported in October, 1935.

The association estimates total domestic stocks of crude rubber on hand Oct. 31, at 219,553 long tons, which compares with Sept. 30 stocks of 228,477 long tons and 322,857 (revised) long tons on hand Oct. 31, 1935.

Crude rubber afloat to U. S. ports as of Oct. 31 is estimated to be 67,825 long tons as compared with 62,240 long tons afloat Sept. 30 and 49,913 long tons afloat Oct. 31 a year ago.

October reclaimed rubber consumption is estimated at 12,606 long tons, production 14,737 long tons, stocks on hand Oct. 31, 26,389 long tons.

Rickenbacker to Get Poor Richard Medal

Poor Richard Club, advertising club of Philadelphia, will honor the aviation industry at its Annual Banquet, Jan. 15, 1937, with the theme "America Flies Ahead." Captain Eddie Rickenbacker, American "ace" during the World War, will be guest of honor and will receive the Poor Richard Medal of Achievement. The award is given annually to an outstanding American in his field of endeavor. Alfred P. Sloan, G. M. president, received it in 1936.

141 New Studebaker Dealers

One hundred and forty-one Studebaker dealers were appointed by the Studebaker Corp. during the month of October, bringing appointments for the year to date to 851, according to Geo. D. Keller, vice-president in charge of sales.

Sit-Down Again Closes Goodyear Plant No. 1

Operations in plant No. 1 of the Goodyear Tire & Rubber Co. in Akron were completely suspended for an indefinite period Nov. 18 following the rapid spread of a sit-down movement started by 100 employees Tuesday night. About 7000 workers are affected by the shutdown. Goodyear plant No. 2 continues to operate on a regular schedule. The plant No. 1 sit-down resulted from a dispute over wage rates, it was stated. Union officials went into immediate conference with company officials in the hopes of adjusting the differences and having the plant reopened promptly. Goodyear officials, however, gave no indication as to when work might be resumed.

Canadian Outboard Motor Firms Merge Businesses

The Johnson Outboard Motor Co., Peterborough, Ont., has announced an amalgamation with the Evinrude and Elto companies, whose combined Canadian and British export trade will be handled by the Peterborough factory. "This amalgamation will have the effect of doubling production in our local factory," said Hugh M. Campbell, general manager. In the United States the companies will operate as separate entities in the engineering, manufacturing and sales departments, but in Peterborough all these departments will be combined.

Sit-Down Closes Bendix

(Continued from page 699)

mitted to converse through the open windows with friends. Whiskey is banned. The heat is turned off. There has been no violence and none is expected.

The issue is definitely that of a closed shop. There has been no question raised as to wages or other working conditions. Mr. Bendix is determined to fight the closed shop, it is understood, and will not compromise. Both the UAW and the Bendix Employees Association have substantial memberships but it is not evenly distributed among departments. The sit-down took place in two departments where the UAW is reported to have a majority.

U. S. Highways Model for World, Says Pyke Johnson

Pyke Johnson, vice-president in charge of the Washington bureau of the Automobile Manufacturers Association, addressed the Detroit Section, S.A.E., on Nov. 16, taking as his subject the development of world highways and the influence of the movement upon better international relations politically and economically. A feature of his presentation was a series of slides showing photographs and maps of the Pan-American highway which will eventually span the American continent; also pictures of the International highway through Europe.

Mr. Johnson credited American highway engineers and particularly the U. S. Bureau of Public Roads with having started this world-wide highway program. It is a fact that the engineering phases of the road building program are based upon the principles developed in the United States and made available to foreign governments all over the world.

Weckler Is Named De Soto Vice-Pres. and Gen. Mgr.

Appointment of Herman J. Weckler as vice-president and general manager of the DeSoto Motor Corp. in Detroit was announced Nov. 18. Mr. Weckler, who had been works manager at Buick, left that position in April, 1932, and joined the Chrysler Corp. in June of that year. During the last year he directed the building and equipping of the new $5,000,000 DeSoto plant in Detroit.

Car Exports to Canada Gain

Effects of Reciprocal Treaty Seen in Reduced Parts Shipments Against More Finished Units

Canadian importations from the United States of complete motor vehicles and chassis increased during the first six months of 1936, by $2,100,000 over the corresponding period of 1935, according to an analysis by the State Department of the Canadian-American reciprocal tariff agreement, which became effective Jan. 1, 1936.

Imports into Canada of parts for replacement, including engines, showed a gain of $1,300,000. On the other hand, automotive parts, including engines which have for some years represented the major part of Canadian purchases of automotive products from the United States, showed a decline of $250,000. While Canadian import statistics do not separate parts for assembly from parts for replacement, the breakdown from the United States record of exports to Canada shows a decline of $1,200,000 against the gain in Canadian imports of parts for replacement. This tendency, the statement said, is confirmed by the fact that automotive engines alone, which are shipped predominantly for assembly and are separately classified in Canadian trade records, showed a decline in imports of $40,000.

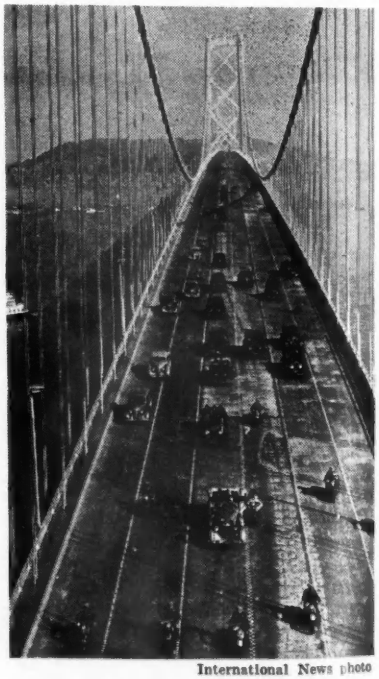
Passenger automobiles and chassis, which received under the agreement both lower duties and the elimination of fixed maximum discounts, accounted for $1,500,000 in the gain of shipments to Canada of motor vehicles and parts for replacement. Trucks and buses, and truck and bus chassis, which were granted similar treatment, were purchased in increased amounts of $379,000 and $160,000 respectively.

The accompanying table gives Canadian automotive imports.

Changes in Canadian Imports of Automotive Products During First Half of 1936

(Values in Thousands of Canadian Dollars)

		Quantity January to June, incl.		Value January to June, incl.		
	Unit	1935	1936	1935	1936	Amount of Change
Passenger cars and chassis	number	1,876	3,802	1,132	2,678	+1,546
Trucks and chassis	number	537	916	403	783	+ 380
Buses	number	5	28	14	173	+ 159
Automobile engines including truck engines	number	22,210	26,212	3,830	3,389	— 441
Automobile parts	....	....	....	9,821	10,012	+ 191
Tractors (valued over $1400) and parts	....	....	....	375	606	+ 231
Diesel engines and parts	number	55	76	227	332	+ 105
Marine and other internal combustion engines	number	3,776	4,805	386	463	+ 77



International News photo

The great San Francisco-Oakland bridge was formally opened Nov. 12 by city and state officials. This view shows the first cars crossing San Francisco-Yerba Buena Island span.

Parts Groups to Meet

Association Conventions to Be Held in Chicago Next Month

The first general session of the National Standard Parts Association will open Dec. 7 at the Hotel Sherman in Chicago. The morning session will begin with a talk by Boake Carter, radio commentator, and addresses by Mayor Kelly of Chicago and John P. Muller, NSPA president.

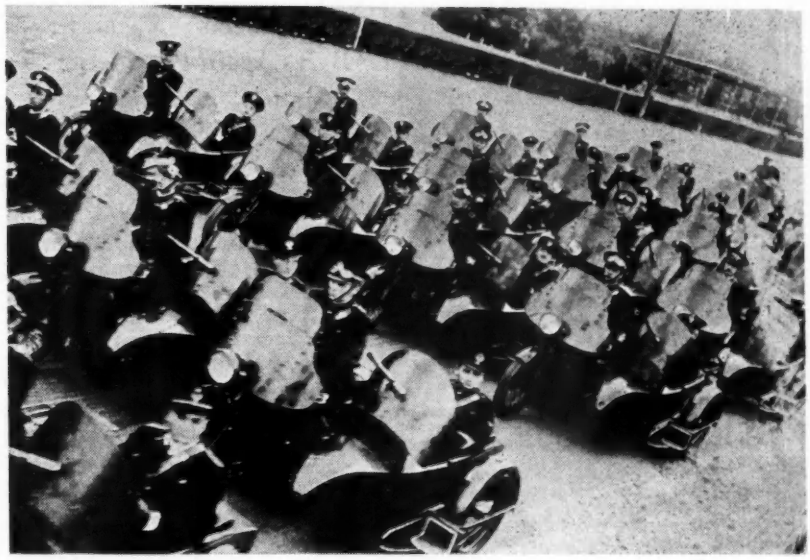
Manufacturers' and wholesalers' divisional meetings will be held in the afternoon, the former with addresses by Whiting Williams of Cleveland; George E. Quisenberry, editor of *The American Automobile;* "Doc" Proctor, secretary of the NSPA manufacturers' division; and the latter with addresses by F. D. Mayer, president of the Merchandising Institute of America; E. R. Michener of the H. & H. Machine & Motor Parts Co., and Herbert Nigg of the NSPA.

Principal speaker at the second general session on the morning of Dec. 8 will be Leon Banigan of the Edison-Splitdorf Co., followed by Harry Mathews, Commercial Credit Co.; J. W. Van Allen, NSPA counsel, and L. F. Hunderup, NSPA senior vice-president. Election of officers will take place at the third general session in the afternoon.

Principal event of the Motor and Equipment Manufacturers' Association during the show week in Chicago will be the annual informal dinner and business meeting, scheduled for the evening of Dec. 10 at the Blackstone Hotel. Among the speakers will be G. E. Weaver of the Weaver Manufacturing Co.; J. L. Palmer, Chicago University School of Business, and David Clarke, Chicago attorney. Fred G. Wacker, MEMA president, will preside.

The first two general sessions of the Motor and Equipment Wholesalers' Association's convention will be held Dec. 7 at the Stevens Hotel, followed by the Gold Star convention meeting in the evening. Representative Wright Patman will discuss at the evening meeting both the Robinson-Patman Act and new legislation proposed to divorce manufacturing from retail operations.

Additional sessions will be held Dec. 8 in the morning and afternoon, with the evening reserved for an overflow meeting if necessary.



Acme photo

A new type of armored motorcycle recently adopted by Italian police was displayed in Rome recently.

Atlanta Sit-Down Strike Closes Fisher Body Plant

The Fisher Body plant at Atlanta suspended operations shortly after noon Nov. 18 when several men in the trim department sat down on their jobs. The entire plant was forced to close because of the continuous nature of operations. Approximately 800 men were affected. Efforts were made by the management to reopen the plant after the rush period, but were unsuccessful.

Conferences between the men and the management failed to bring satisfactory settlement. The men stopped work following the disciplinary lay-off of one employee who had violated an existing shop rule against wearing of an insignia, a rule adopted for the purpose of avoiding controversies among employees and discrimination charges.

Tire Shipments 16% Higher in September

Shipments of pneumatic casings during the month of September are estimated at 3,835,998 units, a decrease of 22.9 per cent under August, but 16 per cent above shipments made in September, 1935, according to statistics released by the Rubber Manufacturers Assocition, Inc. Production of pneumatic casings for September are estimated at 4,981,131 casings, a decrease of less than one per cent under August but 31.5 per cent above September, 1935.

Pneumatic casings in the hands of manufacturers, Sept. 30, 1936, are estimated at 9,005,065 units.

Sales Outstrip Production

(Continued from page 699)

dance and prospects. Now, although attendance is setting new records and there are more enthusiastic prospects among the visitors, the talk is mostly of actual orders being taken.

Retail sales of Hudsons and Terraplanes in the U. S. for the week ending Nov. 14 totaled 1820 cars. This exceeds sales for the corresponding week of 1935 by 28 per cent and is a gain of 29 per cent over the preceding week this year.

December dealer orders for 1937 Ford V-8 trucks and commercial cars for domestic use are the largest in the history of the Ford Motor Co., totaling 35,043 units, it was announced at the home office of the company.

Studebaker reports sale of 2787 passenger cars and trucks during the first 10 days of November, compared with 1137 in the corresponding period in 1935. Sales for the year to Nov. 10 were 78,238 compared with 42,567 last year—an increase of 83 per cent.

Establishing a new production record, the Dodge truck plant at 11 a. m. Nov. 17 manufactured its 100,000th truck since Jan. 1 of this year. This event was celebrated by the presence of a number of automobile executives, city leaders and newspaper men as the truck came off the assembly line.

A material upward revision of the 1937 sales projection of Pontiac Motor Co. has been made. November and December schedules have both been increased and the plant is turning out more than 1000 cars a day, according to C. P. Simpson, vice-president and general sales manager. "Our bank of unfilled retail orders is two and one-half times greater than at any time during the last year, including the peak of the spring selling season," he said.

The Buick Motor Co. this week came within a few cars of an all time high in daily production, it was announced by Harlow H. Curtice, president. He said that output has been increased to the limits of capacity and a new schedule for December calls for the production of 28,000 cars. Unfilled orders at the factory and in zone points throughout the country were placed at 56,123 units.

Chevrolet has increased production to 6000 cars a day and is making average daily deliveries more than double those of a year ago. In the first few days after the 1937 announcement, deliveries reached 11,000 a day, compared to 4500 after last year's announcement. More than 65,000 cars have been delivered to buyers and the firm's 10,000 dealers have taken orders for another 100,000, W. E. Holler, vice-president, said.

A revised edition of the **Directory of Commercial Testing and College Research Laboratories** which has been prepared by the National Bureau of Standards is now available. It may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 15 cents a copy.

"Automotive Uses of **Nickel Alloy Steels**" is the title of an interesting bulletin just announced by the International Nickel Co., Inc., New York.*

A 24-page bulletin, Wp-1061, showing its equipment for contractors, has just been brought out by the Worthington Pump and Machinery Corp., Harrison, N. J.*

An attractive brochure, entitled "The Conquest of Weight," has just been issued by the Edward G. Budd Mfg. Co., Philadelphia. The fabrication of **stainless steel** by means of the **"Shotweld" process** is discussed.*

"A Check List of Possible Effects of the Robinson-Patman Act," prepared by Dr. Willard L. Thorp and Edwin B. George, has recently been issued by Dun and Bradstreet, Inc., New York. Available at all Dun & Bradstreet offices.

The Hannifin Mfg. Co., Chicago, has recently brought out bulletin No. 39, which describes its "Hy-Power" **hydraulic riveters.***

*Available through AUTOMOTIVE INDUSTRIES.

New Chrome-Hardening Process

The development of a new chrome-hardening process for engine cylinder walls has been announced by R. A. Lister & Co., Ltd., engine manufacturers, of Dursley, Gloucestershire, according to a report to the Commerce Department. The new process, it is claimed by the developers, increases the wear resistance in Diesel engine cylinders by as much as 400 per cent.

API Elects Officers; Byles Again President

Axtell J. Byles was reelected president of the American Petroleum Institute at its annual convention in Chicago last week. Among the other officers reelected were: vice-president-at-large, K. R. Kingsbury, Standard Oil Co. of California, San Francisco; vice-president-for-production, George A. Hill, Jr., Houston Oil Co., Houston, Tex.; vice-president-for-refining, W. S. S. Rodgers, Texas Co., New York City; vice-president-for-marketing, C. E. Arnott, of Socony-Vacuum Oil Co., Inc., New York City; executive vice-president, W. R. Boyd, Jr.; treasurer, O. D. Donnell, Ohio Oil Co., Findlay, Ohio; assistant secretary and treasurer, Lacey Walker, Teaneck, N. J.

The mid-year meeting of the Institute is to be held at Colorado Springs, Colo., June 1-3, and the next annual meeting is to be held at the Stevens Hotel, Chicago, next Nov. 9-12.

New Allis-Chalmers Branches

Allis-Chalmers Mfg. Co., Milwaukee, has established new branch offices for the tractor division at Sioux City, Ia., Indianapolis, St. Louis and Los Angeles to handle rapidly expanding demand. The tractor division, with headquarters at the main works in Milwaukee, now operates 30 branches, each averaging 25 employees.

Automotive Metal Markets

Mounting Steel Mill Efficiency Lowers Sheet Cost $8 per Ton; Non-Ferrous Metals Firm

By William Crawford Hirsch

Announcement by the second largest steel producer of the letting of a $35,000,000 contract for the construction of an additional four-high continuous sheet mill, with an annual capacity of 600,000 tons, comes as an impressive reminder of how rapidly the steel industry's physical equipment is being transformed to serve the automobile manufacturing industry more efficiently. Profitable operation of mills of this type is predicated on tonnage orders. A Wall Street writer, discussing the savings entailed in sheet production in such mills, points out that the cost per ton is $8 less than it was with the older type rolling mills. He failed to mention, however, that every minute that a mill of this type stands idle, more than $3 is added to the charge on the investment tied up in it.

To make possible orderly amortization, a continuous mill must average this year around at least a 50 per cent of capacity rate of output. With approximately 11,000,000 tons of capacity added to potential sheet output through installation of this type of automatic equipment in recent years, the tonnage problem becomes a matter of life or death to the steel industry. It cannot afford to leave anything undone to foster consumption of sheet steel by the country's automobile manufacturing industry. This serves to explain in a large measure the spirit of moderation in evidence with reference to price mark-ups.

A good deal of business that is in the twilight zone between bona fide fourth-quarter needs and 1937 initial requirements apparently was booked in the last few days by steel producers. Lively buying of semi-finished steel is noted, Ford being mentioned among those taking large quantities of billets and sheet-bars.

Pig Iron—Considerable buying by automotive foundries awaits announcement of definite first quarter prices. Meanwhile the movement of pig iron previously contracted for to melters is brisk.

Aluminum—Firm and unchanged.

Copper—Copper & Brass Research Association announced this week that the automobile manufacturing industry would consume approximately 250,000,000 lb. of copper in 1937. Waterbury, Conn., the brass manufacturing industry's center, reports a return to its all-time employment high, 35,500 persons. The copper market has turned more orderly. Speculation in London has abated and the demand abroad appears to be more genuinely of an industrial and armament character. Electrolytic continues to be quoted at 10½ cents, delivered Connecticut Valley.

Tin—Following hectic days, when consumers who had to cover their needs, paid 10 cents more a pound for tin than they would have had to pay a week earlier, the market showed signs of the stranglehold that speculators on the bull-side had. Predictions of 55-cent tin failed to materialize and at the beginning of the week spot Straits was quoted at 51.65 cents.

Lead—The market gained additional strength under the momentum of heavy demand. Early this week the New York price had soared to 5.20 cents.

Zinc—Firm, with the undertone strong.

Calendar of Coming Events

SHOWS

9th International Automobile Salon, Milan, Italy ..... November
International Aviation Show, Paris, France ..... Nov. 13-29
Brooklyn Automobile Show..... Nov. 21-28
Cleveland Automobile Show..... Nov. 21-28
Montreal Automobile Show..... Nov. 21-28
Kansas City Automobile Show.. Nov. 21-29
Milwaukee Automobile Show..... Nov. 21-28
Portland Automobile Show..... Nov. 22-29
Baltimore Automobile Show. Nov 26-Dec. 5
28th Automobile Salon, Brussels, Belgium ..... Nov. 28-Dec. 9
Peoria Automobile Show.. Nov. 30-Dec. 5
Natl. Exposition of Power & Mechanical Engineering, Biennial Meeting, New York City ..... Nov. 30-Dec. 5
First International Consumers Petroleum Exposition, Convention Hall, Detroit ..... Dec. 5-13
Automotive Service Industries Joint Show, Chicago ..... Dec. 9-13
National Motor Boat Show, New York, Jan. 8-16
Illinois Automotive Ass'n. 4th Annual Show and Maintenance Exhibit, Navy Pier, Chicago..... Apr. 24-28, 1937

CONVENTIONS AND MEETINGS

Tin Can Tourists' Get-Together Meeting, Lake City, Fla. ..... Nov. 22-28
American Society of Mechanical Engineers, Annual Meeting, New York, Nov. 30-Dec. 1
National Standard Parts Association, Annual Convention, Detroit... Dec. 7-8
Tin Can Tourists' Homecoming, Arcadia, Fla. .... Dec. 28, 1936-Jan. 3, 1937
S.A.E. Annual Meeting, Detroit, Mich., Jan. 11-15, 1937
Tin Can Tourists' Winter Convention, Clearwater, Fla..... Jan. 29-Feb. 8, 1937
Tin Can Tourists' Winter Convention, Sarasota, Fla. ..... Feb. 8-14, 1937
International Association for Testing Materials, Second International Congress, London, England, April 19-24, 1937
41st Annual Convention and Exposition of the American Foundrymen's Association, Milwaukee, beginning May 2, 1937

Just Among Ourselves

New York Show Reaches New High

LINGERING doubts about the effectiveness of November automobile shows were dispelled for most people by the National Automobile Show in New York which closed this week. The attendance was estimated at 300,000, about 75 per cent above that for last year.

Several days of show week set new records for attendance on individual days, records which exceed anything in the thirty-seven years of New York Automobile Shows.

Dealers from 34 states and 23 foreign countries came to look at the new cars. One overseas delegation, from Germany, included 29 members. Actual sales, appointments for demonstrations, and prospect listings exceeded anything within recent memory, according to the show management.

* * *

Weather Helps Attendance

ALL of which was helped enormously by the good average weather which prevailed throughout show week. There was a lingering hint of Indian Summer in a couple of days, which gave some point to the coach trailer exhibits. Starry eyed maidens and their hard-boiled escorts parked fur coats on the trailer exhibit floor, and many of them spent the whole day wandering from exhibit to exhibit, asking thousands of questions about housekeeping details on the tourist trailers. Memo: some smart trailer manufacturer, when he exhibits, is going to have a saleswoman on the job who can give convincing answers on the domestic details of living in a trailer.

Most of the factory executives who were in New York for the show pulled out by Saturday of the opening week. By Sunday, it was the public's show and the public liked it.

* * *

Questionnaire Boys Busy

THE questionnaire boys were busily at work on the fringes of the Grand Central Palace, getting public reaction to particular cars and particular features. Not so much activity in this direction, on the whole, as there was last year, when several car manufacturers put on similar stunts within the purlieus of their own exhibits. This year's efforts were mostly of the less spectacular job-of-work variety, which have been producing usable results for sales and advertising managers.

* * *

New Features This Week

WHETHER or not you attended the show it will pay you to read the discussion of mechanical trends in the new cars which begins on page 710 of this issue of AUTOMOTIVE INDUSTRIES. On page 723 we begin to present **something you haven't seen in a long time**—complete mechanical specifications on the new cars. Next week there will be more mechanical specifications, and they will be followed by minute details of 1937 body construction and dimension. Not content with this, we initiate on page 717 (this issue) a series of cross-section drawings on new engines, etc., which will be continued just as long as readers show any interest in it. These are the first of a sequence of plus values which will appear herein during the coming season. Engineers, production men and merchandising executives—all will find new features of specific interest to them and, if you ask us, could get a lot out of reading those features which seem especially directed to each other's vocations.

* * *

Heavies Are Going Light

WITHIN the past **three** years, three truck manufacturers have chosen three ways to give themselves an entry into the popular light-truck field. As noted in the news section this week, one of the agreements which effected such an arrangement has been terminated. We believe that this marks the beginning of the reversal of a trend, and that you are likely to find several heavy-duty truck manufacturers in the light-duty field before the year is out. And we mean by that, that the light trucks will be flowing from the assembly lines of the heavy-duty fellows.

* * *

A New One On the Horizon

ANOTHER passenger car is on the way too. Designed chiefly for the export market, and assembled from time-tried units, it is expected to have some sales in domestic small towns, where a four-cylinder car, not too radical in style, can be sold at a price to farmers who would like to give up Model T, but have to be convinced that they would save money by doing it.—H. H.

Survey of 1937 Cars

Shows Greater Riding Comfort, More Engine Power in the Lower

By P. M. Heldt

NO radical or revolutionary features are being introduced in passenger cars at the beginning of the 1937 season*; among the new models there are none with rear-mounted engines, or with automatic or semi-automatic transmissions as standard equipment. Engineering departments seem to have directed their efforts toward consolidating earlier engineering advances and to bringing into line such parts as were neglected in the modernization processes of former years.

Engine power has been further increased, particularly at the lower end of the scale, and bodies have been made roomier, with a view to making them more comfortable for the occupants and to permit of carrying more luggage conveniently. The additional room has been made available in some instances by increasing the wheelbase and in others by shifting the powerplant forward. Once more much effort has been spent on front-end appearance, and practically every 1937 model will present a new face.

In view of the large proportion of the market which they control, much interest naturally centers in the cars at the lower end of the price scale. These have been so much improved in recent years that their appeal is no longer confined to those whose purchasing power limits them to that class. This is plainly brought out by the fact that all of these are now being offered in two lines, one apparently designed to appeal to those who prize performance, the other more suited to those who are looking for economy. Thus the Ford V-8 is this year being offered with optional engines of 60 and 85 hp. ratings, respectively. Chevrolet has attacked the problem by providing different rear-axle ratios, a larger ratio for the customer who wants performance mainly, and a smaller ratio for the one who wants high gasoline mileage. In addition, of course, these different lines are being offered in a considerable variety of body styles and with differences in equipment. Other manufacturers have added new lines. Thus Packard has an entirely new Six, a companion to the very successful 120 straight eight brought out two years ago, but in a slightly lower price class, and the Cord is now being offered with both a conventional and a supercharged engine. This brings the number of car lines with supercharged engines available on the American market up to four. One of the principal problems of supercharger installation is that of the drive, and Graham has changed its supercharger drive, which is now through a belt instead of the front-end gears, the final step-up through worn gearing being retained.

*See AUTOMOTIVE INDUSTRIES, March 28, 1936, page 474.

Engines

AS regards engines, there has been only one noteworthy switch in the type used—the LaSalle is a V-8 once more, instead of a straight eight. When the straight-eight engine took the place of the V-8 some years ago, the reason for the change was said to be that making the two banks of cylinders and the crankcase in a single casting involved considerable difficulty and led to a high proportion of "wasters." Since that time a new design of single-block V-8 has been placed in production by Cadillac, and the production problem apparently has been satisfactorily solved. It may be that here, too, the desirability of more roomy bodies, of which car manufacturers very generally seem to have become aware this season had its influence, for not only did LaSalle change from the straight eight to the V engine, which must have set free a considerable amount of chassis length, but it also increased the wheelbase 4 in.

The Packard Six and the Chevrolet engines are of entirely new design this year. The former is an L-head, the latter a valve-in-head engine. Both have four-bearing crankshafts, this being an increase from three to four main bearings in the case of the Chevrolet. The latter engine is of the same general type as its predecessor (six-cylinder, valve-in-head), and the main object in redesigning it seems to have been to achieve smoother operation in the higher speed range. The displacement is somewhat greater (216 instead of 206 cu. in.) and as the rating is now 85 instead of 79 hp., the specific output has been boosted about 2.5 per cent, which is probably accounted for by the increase in the compression ratio (6.00 to 6.25). The principal changes in the design are the increase in the number of crankshaft main bearings from three to four, an increase in bearing diameters, and a better distribution of metal in the crankcase so as to increase its rigidity without adding to its weight. The increase in the bore was accompanied by a decrease in the stroke, so that the stroke/bore ratio is now much lower (1.07 instead of 1.21). Reversing the trend of former years, the Chevrolet has been considerably lightened, the sedan weighing about 200 lb. less.

Piston displacements were increased also by Oldsmobile and Pontiac, while Hudson and Terraplane increased engine output by improvements in carburetion and manifolding. All of these engines have increased ratings. In the Zephyr engine the cylinder heads have been stiffened by ribs between bolt bosses, and the Pontiac now has its crankshaft fully counter-balanced. In the Graham the connecting-rod heads were stiffened.

Restyling and Price Models

Pistons

WITH the constant increase in engine speeds the exhaust valves are very severely taxed, and to meet the situation at least two steel plants have recently developed new steels for such valves. The Chrysler lines and Graham have exhaust valves of these new austenitic steels. Buick has adopted a streamline form of intake valve to ease the flow of charge into the cylinders and thus to improve the volumetric efficiency. Valves of this general design have been used in aircraft engines for some years.

Further improvements have been made in automatic tappet adjusters. All Cadillac V-8 engines now have an improved form of hydraulic tappet adjuster in which the oil reservoir formerly provided has been eliminated. These automatic tappet adjusters, appropriately enough, came into use first on valve-in-head engines, where the difficulties due to differential heat expansion are the greatest. Buick this year has a new scheme of compensating for this differential expansion, consisting in the use of rocker-arm brackets of aluminum alloy. Lincoln also has adopted automatic hydraulic tappet adjusters.

Packard and Graham use the new Autothermic pistons recently described in AUTOMOTIVE INDUSTRIES*, in which parallel strips of steel and aluminum control the heat expansion of the piston skirt. A new design of aluminum piston is used also on Chrysler Corporation engines, with a "U" slot in the skirt, while Ford has a brand new piston of cast steel. In a new Buick piston there is a "heat-deflection" groove above the top piston ring, which is evidently akin to a groove without ring.

Considerable criticism has been directed at the automatic choke, a novelty introduced a couple of years ago, because it occasionally failed to operate properly. To meet the criticism, Cadillac last year provided an alternate hand control. This, however, has now been omitted as unnecessary, which would point to the elimination of at least some of the faults of the earlier device. One of its weaknesses was due to the fact that it had to operate with fuels of very different volatility. No manufacturer seems to have abandoned the automatic choke.

The new Packard Six is equipped with a Chandler-Grove carburetor**, a newcomer in the passenger-car field. Dual carburetors are used on practically all eight-cylinder engines, but their application to six-cylinder engines by Terraplane seems to be a new departure, at least as far as this country is concerned. The need for a dual carburetor arises from the fact that in multi-cylinder engines there is considerable overlapping of inlet periods, and if any section of the manifold carries charge to two cylinders simultaneously, charge distribution is likely to be quite non-uniform. In six-cylinder engines there is, of course, considerably less overlapping of inlet periods, but tests must have shown that there, too, a gain in output and in economy can be made by supplying cylinders that follow one another directly in the firing order through different manifold passages. Better provisions against vapor lock have been made by Dodge and Hudson, among others.

*See AUTOMOTIVE INDUSTRIES, Oct. 3, 1936, page 450, and Sept. 5, 1936, page 318.

*See AUTOMOTIVE INDUSTRIES, Sept. 12, 1936, page 352.

Voltage Control

AN outstanding development in connection with the electrical equipment this year is the adoption of voltage control for the generator circuit. The general principle of voltage control is not new by any means, having been familiar since the introduction of electrical equipment on motor cars; its advantages over the heretofore general third-brush control and its weaknesses were also well known; it seems that with the increase in the demand for electric energy on modern cars, due to the installation of radios, car heaters with electric fan, etc., its advantages have gained in importance, while its weakness, due to its mechanical vibrator, have been further reduced. The principal advantages of voltage control is that it varies the charging rate in accordance with the state of charge of the battery. When the battery is nearly discharged it receives a heavy charging current, whereas if it is already fully charged, the charging current drops very low, thus preventing unnecessary waste of energy and loss of battery electrolyte through gassing. In view of the increasing demands on the electric system, battery sizes have been increased in some cases. Hudson, Ford and Willys now place the storage battery under the hood. In the past one objection to this location has been that the battery is likely to reach a higher temperature there than in the usual position below the chassis, so that the loss of distilled water is even more rapid, but this has been met by providing a duct through which cooling air is passed over the battery.

All Packard engines now carry the miniature 10 mm. spark plugs, whose virtue resides in the fact that their insulators do not reach so high a temperature, so that there is less tendency to self ignition. Packard has switched from fuses to automatic circuit breakers for the protection of the electric lines, and Cadillac has abandoned vacuum control of spark timing.

Cooling systems have been improved in detail. LaSalle now also has a closed cooling system, which makes it possible to operate with a somewhat higher jacket temperature and tends to prevent loss of alcohol in winter time. In the Buick cooling system there is a fixed by-pass passage, which allows the cooling fluid to expand when the

heat of the metal parts of the engine is thrown into the water on stopping after a hard drive, and thus prevents unnecessary loss of alcohol. Improved pump packings are provided on Buicks and Chevrolet.

Now that the water filler neck is located under the hood, instead of on the outside, there is danger of dropping the cap into the engine compartment, from where it can be retrieved only with difficulty (especially when it is being handled while quite hot), and on the Zephyr the cap is therefore attached to the filler neck with a metal chain.

Engine Lubrication

PROBABLY the most noteworthy improvement in engine lubricating systems is that on the Graham, where oil is fed directly to the cylinder bores from the pressure lubricating system through the valve tappets, which latter act as piston valves. One generally recognized weakness of conventional lubricating systems is that with them it takes a rather long time before oil reaches the cylinder walls when the engine is being started from cold, and piston scoring may possibly start during this period. With the Graham system the oil does not have to pass through the narrow clearance spaces of the connecting-rod bearings to reach the cylinders. Chevrolet retains splash lubrication for cylinders and connecting-rod bearings, the main bearings having direct pressure feed. A gear pump has been substituted for the vane pump formerly used in the Chevrolet lubricating system.

Various steps have been taken by different manufacturers to assure the delivery of clean oil to the engine bearings. Studebaker has adopted a new proprietary filter and advises customers that oil need be renewed only at the change of seasons. Buick has replaced the outside oil filter by a floating screen at the pump inlet, while Dodge now provides a larger oil filter that need not have its filtering element renewed so frequently. Graham has improved its crankcase ventilating system, taking advantage of the centrifugal head created by crankshaft rotation to draw air into and force vapors out of the crankcase through suitably located ventilating openings.

Transmissions

CLUTCHES remain unchanged for the most part. Lubrication of the throwout bearing is still a problem on some cars, and Dodge reports an improvement in this respect, involving, I believe, the use of thrust discs of porous, oil-absorbing metal. Automatic clutches are offered by Hudson as an extra, and the free-wheeling feature associated with these clutches is stressed. Freewheeling can take place only when the engine is turning over slowly, which eliminates its dangers, and can be prevented instantly by pressing down on the accelerator. Oldsmobile this year has a clutch facing consisting of spirally wound friction material, which is more yielding and therefore assures smoother engagement.

While a great deal of work has been done on transmissions of the automatic and semi-automatic type, none of them appear as standard equipment at the beginning of the 1937 season, though Hudson continues the electro-pneumatic-shift transmission as an option. Transmissions of the Cadillac and Chevrolet, while remaining of the conventional manual-shift, helical-gear synchromesh type, have been completely redesigned for greated compactness and reduced weight. In the Cadillac all of the gears have helical teeth, low and reverse gears being engaged by shifting the driven member on helical splines on the main shaft. Ford also has a transmission of the all-helical type this year.

The Cadillac transmission housing has no cover plate but a removable bottom plate. Cadillac transmissions have had pressed steel bottom plates for some time and experience probably has shown immunity from oil leakage. The Chevrolet transmission is not only more compact and lighter, but the torque-ball socket, speedometer-drive housing, and rear-support pad are included with the housing in one casting, so it is undoubtedly a better production job.

Buick this year has followed the Cadillac practice of providing a rearward extension on the transmission housing, so as to shorten the propeller shaft. Gearshift lever towers usually extend up into the driver's compartment, and it is not uncommon for oil or grease to ooze out through the joint of the ball-mounted shift level and soil the clothing of persons in the front compartment. To prevent this, a rubber boot is placed over the tower in the Zephyr this year. Dodge now provides a roller support for the transmission shift rail, to make shifting easier, while Studebaker has an improved synchronizing mechanism.

Overdrives have made considerable headway this year, though they are still standard equipment on few cars only. They come regularly on the Chrysler Airflow, the Studebaker President, and the Pierce-Arrow, and they are being offered as extras by DeSoto, Graham and Nash. Nash cars equipped with the overdrive come with a special speedometer which indicates to the operator the lowering in engine speed resulting from the use of the overdrive. The Studebaker overdrive differs from those previously in use, in that it has a foot control which is superimposed on the automatic control. To cut in the overdrive (at any speed above 35 m.p.h.) the foot is lifted quickly from the accelerator and then pressed down gradually, while to cut it out the foot is lifted and then pressed down quickly.

There are one or two novelties in the line of universal joints. Studebaker uses a rubber-type universal commercialized by Thompson Products, which requires no lubrication and which also functions as a slip joint; Dodge has a new metal universal joint which is said to require no renewal of the lubricant supply in 30,000 miles, and Cadillac has a novel slip joint of exceptionally large diameter and correspondingly low pressure on the splines.

Propeller Shafts

THE tendency toward reduced overall height of cars has continued, and the problem of interferences between the propeller shaft and the floor of the car has been solved in various ways. Pontiac and Oldsmobile have gone to

the two-section propeller shaft, with an intermediate bearing mounted on the X-member of the frame. This construction, of course, has the additional advantage of making the rear section of the propeller shaft materially shorter and therefore less given to whip. Pontiac has made the further change of substituting the Hotchkiss for the propeller-shaft drive, probably because the former lends itself better to use with the two-section propeller shaft, and because it makes possible a worthwhile saving in weight.

The most notable mechanical change for the 1937 season is the wide adoption of hypoid-gear drive. Hypoid final drives are found on Buick, Cadillac, Chevrolet, Chrysler, DeSoto, Dodge, Hupmobile, LaSalle, Packard, Pierce-Arrow, Plymouth and Studebaker cars this year, from which it may be judged that a very large proportion of all 1937 cars will have hypoid rear-axle gears.

The reason for the use of the hypoid gear is, of course, that it locates the propeller shaft end considerably lower than the conventional bevel-gear drive does, and permits of lowering the floor in the rear compartment or of dispensing with a tunnel in that compartment.

In several General Motors lines the rear-axle gear ratios have been reduced, so that the engines run at a lower speed for a given car speed. Such a change would normally reduce the acceleration of the car, but this is prevented in the cars in question by an increase in the piston displacement. On the Chevrolet the rear-axle bevel pinion is offset relative to the center of the differential gear, to effect a better division of load between the two differential bearings.

There is not much new in connection with brakes this year. More cars have the parking brake lever under the cowl on the left side of the driver, where it does not obstruct the front compartment. On the larger Packards additional anti-friction bearings have been introduced in the braking system, to make application of the brakes easier, and the Ford has a new braking system in which the brakes—which are described as having controlled energization—are applied by cables passing through conduits, instead of by rods.

In chassis frames the change-over from channel-section to box-section side members continues, and box-section cross members also are coming into use. The most notable development in frames this year is the widespread adoption of I-section X members, which were first announced last winter and were shown to add greatly to the torsional stiffness. Where box-section side rails are used, the fastening of brackets to them presents a new problem, as the usual riveting is evidently inapplicable. On the Chevrolet, parts are fastened to the box section by bolts, and these bolts pass through reenforcing tubes in the box section. The Chevrolet frame, moreover, has been redesigned so as to be simpler or more open, and thus to give better access to parts that require periodic service.

Suspensions

SOME gain has been made in independent front-end suspension. The Chevrolet independent front suspension (Dubonnet system) is now standard equipment on the Master DeLuxe line, while last year it was optional at extra cost on the corresponding line. Packard, which developed an independent front suspension for its 120 model brought out two years ago, now equips all of its models with this suspension. Pontiac has changed from the Dubonnet to the linked-parallelogram type of independent suspension as heretofore used on Buick, Cadillac and LaSalle cars.

On other cars changes have been made in the flexibility of the front or rear springs with the object of equalizing the rates of oscillation of the front and rear ends of the car, thus eliminating pitch and producing a "flat ride." Front springs have been made softer on the Zephyr, Graham and Pontiac, while in the Chevrolet the rear springs were shortened (and evidently stiffened), with the same object in view. Dodge and Hudson also lowered their spring rates. With the softer suspensions the problem of side sway on curves becomes more important. Where suspension is by the usual side springs, the swaying is greatly influenced by the spacing of the springs on opposite sides, varying in inverse proportion to the square thereof. Chevrolet has increased the spacing of the rear springs. Most of the cars with soft front springs are provided with anti-sway bars to control the swaying. These were originally fitted at the rear of the chassis, but some models now have them at both front and rear.

There has been a pronounced swing to the direct acting type of shock absorber this year, which consists of a cylinder and a plunger therein, pivotally secured to the car frame and the axle, respectively. The advantage is claimed for this type that it has relatively large oil capacity and that the pressures in the shock absorber are much lower. Cadillac in two of its models provides anti-friction inserts between spring leaves, and dispenses with spring covers.

Steering Gears

FOR years car designers have endeavored to make steering easier, because ease of handling is a feature that appeals to all car owners. Other developments of recent years, however, have tended in the opposite direction, these including the adoption of balloon tires and the location of the powerplant over the front axle, which placed more weight on the front wheels, and therefore made it more difficult to swing them around in steering. Steering gear ratios were increased on the Hudson, Pontiac and Zephyr. On the Dodge, on the other hand, the ratio was decreased. The steering-gear ratio, however, is only one of the factors entering into the ratio in which the driver's effort on the steering wheel is multiplied, the ratio of arm lengths being another.

A number of cars have had the drag link of the steering gear extend parallel to the front axle for some years (an arrangement referred to as "cross steering"), and Cadillac, LaSalle and Buick have adopted this practice for 1937. The principal reason for this change is that when the powerplant is moved forward to improve the riding qualities, the steering gear comes naturally into a position rather close to the front axle, and if the drag link extended fore and aft it would be quite short and would oscillate through a large angle, especially with the soft front springs now in favor, which would adversely affect the steering. This effect of spring action on the steering gear can be eliminated by making the drag link extend transversely from the steering gear on one side to a lever at the center of the frame (with independent front suspension). The Zephyr also has a transverse drag link

in combination with a transverse front spring, and on this car a transverse steering stabilizer is used evidently to prevent adverse effects of spring action on the steering. Studebaker and Graham use the new Ross twin-lever steering gear. Buick has pointed a new way in steering-linkage practice by eliminating camber, caster and toe-in, and in the Cadillac the caster angle is also made substantially equal to zero.

Dodge has returned to a practice of former years in providing the joints of the steering linkage with grease-retaining leather boots, as has Chevrolet with a "shock-absorbing" drag link (for some quite early cars had springs back of both of the socket halves of the ball joint). Hudson has reverted from shim adjustment to external (screw) adjustment of the gear.

On the larger Packard models all controls have been moved from the steering wheel to the instrument panel. All of the newer cars have the controls on the dash and the older practice of controls on the steering wheel seems to be definitely out. On the Chrysler lines the controls on the dash are sunk in recesses so that they do not project above the panel, this being a safety measure. Also for reasons of safety, the lower edge of the instrument panel is made sufficiently high so it clears the knees of the front seat occupants.

Accessories

A FITMENT that is being offered on a considerable number of cars for the first time this year is a windshield defroster. In most cases it is being offered as extra equipment. The device consists essentially of a manifold connecting to the heater outlet, by means of which a blast of hot air is directed over the windshield glass in front of each front-seat passenger. Such defrosters have been on the accessories market for some time and evidently appeal to car owners.

Headlamps are now generally supported by streamlined brackets extending sideward from the radiator shell, instead of by brackets rising from the frame side rails. The headlamps are generally mounted somewhat higher than in the past, and an elongated acorn shape is favored for the lamp shells, which would be a good streamline form if the lamps were at a considerable distance from adjacent parts so that the air flow over the lamps would not be materially influenced by these parts. On Cord, Ford, Lincoln, Pierce-Arrow, Willys and Zephyr cars the headlamps are faired into the fenders. License-plate brackets at the rear are now generally located at the center, and a special license plate lamp, distinct from the tail light, is provided.

"More roomy bodies" is a frequently recurring expression in descriptions of 1937 models (Buick, Cadillac, Chevrolet, Chrysler, DeSoto, Dodge, Hudson, LaSalle, Plymouth, Oldsmobile, Studebaker and Terraplane). In most cases the additional room is gained by increasing the body width. On first thought one is inclined to believe that this general tendency must be the manufacturer's response to complaints from the field regarding cramped bodies. There is a possibility, however, that this increase in seat width is merely the direct result of a style development which aims at the eventual elimination of the running boards, making the body width equal to the overall width of the car. There has been a simultaneous increase in luggage space on several lines (Chevrolet, Ford, Lafayette, Oldsmobile) which in most cases has resulted from shifting the seats forward for a better ride and giving more slope to the rear of the body for better streamlining. The scheme whereby a luggage compartment back of the seat is loaded and unloaded from inside the car does not seem to have worked out as well as anticipated, for in at least one prominent make this compartment has now been made accessible through a door in the rear deck.

As regards the increased luggage space, on which considerable emphasis is placed by a number of manufacturers, it did not seem that last year's models were deficient in this respect so far as their general use was concerned, though when a family goes on a tour of some length, it is usually hard to find enough space inside the car in which to store all of the baggage that has to be taken along, and baggage is always better protected against dust and moisture when on the inside of the car than when carried on a baggage rack on the outside. The forward shift of the rear seats brings them inside of the wheelbase and thus adds to the riding comfort of the rear-seat passengers. Front-seat adjusting mechanisms have been improved.

Bodies

THE all-steel body has made further gains and seems to be destined to become universal. Fisher Body Division of General Motors Corporation has developed a new body design which in variations is carried on the various G. M. lines. It incorporates a heavy structural frame, steel panels, steel "turret top" roofs, and steel floor, all assembled by welding. The doors are of the steel girder type. In the Chevrolet bodies, foot rests for the rear compartment are stamped in the steel floor.

Ford bodies this year will also have steel roofs. Spare tires on Ford cars will be carried in the luggage compartment, accessible from the outside, except on single seat cars, where they will be carried behind the seat. Rear seats have been moved forward—with a view to improving the rear-seat ride—on DeSoto, Dodge, Oldsmobile and Pontiac cars, and in the two last mentioned this displacement amounts to as much as 6 in. It has been made possible, in most cases at least, by moving the powerplant farther forward relative to the front axle. On the DeSoto and Oldsmobile the front seats also were moved further forward this year.

Seat adjustments have been improved on several lines, so that now a fore-and-aft adjustment is accompanied by an angular adjustment which leaves the driver's natural line of vision the same. Drip moldings over the doors, which had disappeared in recent years, have reappeared again (DeSoto, Dodge, Nash, Plymouth). Studebaker has a new type of rotary door latch. Both Ford and Chevrolet now carry safety glass all around as standard equipment.

Windshields are widened in many cases, to increase the driver's field of vision, and the ventilating windshield seems to be coming back. Chrysler has changed back to it and Ford has a windshield of the V type with each section hinged at the top.

On Chrysler Corporation lines the bodies are now secured to the frames by means of bolts passing through rubber bushings and washers, so that the joints are very flexible. On G. M. lines, on the other hand, the bodies are held down to the frame by a large number of bolts, so as to effectively combine the structural stiffness of the body with

that of the chassis frame. Noise insulation has received further attention, and in bodies of Chrysler Corporation lines five different insulating materials are made use of. The reason the steel roof was so long in coming was that it was difficult to prevent drumming with such a roof. The application of efficient sound absorbing materials has solved the problem. In Dodge steel bodies a blanket consisting of two sheets of treated paper with wadding between them is cemented to the roof. Panels and floor are also insulated.

Safety

GETTING a jack under the rear axle in the event of tire trouble has become more and more of a problem as cars were built lower, and bumper jacks were introduced some years ago. Two more makes, Studebaker and Chevrolet, will carry them this year. In the line of extra equipment available, Nash and Oldsmobile offer an electric clock for installation on the glove-compartment door, combined with an electric lamp in the compartment which lights up automatically when the door is opened.

Hudson this year also offers the hill-holder that has become familiar through its use on the Studebaker. Chevrolet has increased its tire size from 5.50 to 6 in., the rim diameter being decreased 1 in. so as to leave the effective outside diameter substantially the same.

The type of hood or hood lid that is hinged to the top of the cowl and lifts at the front has gained in popularity. Running boards having a rubber covering vulcanized to a steel base are becoming more common, and on the Oldsmobile the antenna for the car radio is vulcanized into the rubber covering of the running board. Nash has eliminated louvers in the hood, having found them unnecessary to assure adequate engine cooling, but has not left the hood sides plain.

Several manufacturers, undoubtedly spurred on by the safety-on-highways campaigns, have given special attention to safety features aside from those relating to safe steering and braking equipment. Projections on the outside of the body are eliminated to a large extent, and door handles are curved in at the ends so as to make it practically impossible for the clothing of persons outside the car to be caught by them. Chrysler Corporation engineers have "submerged" all controls on the instrument board below the surface of the latter, so that the front-seat passenger thrown forward in an accident cannot be injured by them. On the Chevrolet the fuel tank, crankcase and radiator filler are now all on the curb side, so that a station attendant in servicing the car does not have to get into the traffic lane. Lowering of the center of gravity and widening of treads also are moves in the direction of greater safety. The Willys, the only American car of less than standard width of tread last year, has become a standard-tread car once more.

Who's Where?

—on the 1937 Passenger Car Price List

All 1937 models arranged by price, with make and body type designated

Under $500

Make and Model	Body Type and No. of Doors	List Price F.O.B.
American-Bantam	Bus. Coupe	$ 335
American-Bantam	Std. Coupe	365
American-Bantam	Roadster	385
American-Bantam	De L. Coupe	385
Willys—37	Std. Coupe	395
Willys—37	De L. Coupe	435
American-Bantam	Cus. Roadster	445
Willys—37	Sedan, 4dr.	450
Ford, V8—60 HP	Coupe	480
Willys—37	De L. Sedan	490
Ford, V8—60 HP	Tudor Sedan	495

$500 to $749

Make and Model	Body Type and No. of Doors	List Price F.O.B.
Plymouth, P3	Bus. Coupe	$ 510
Ford, V8—60 HP	Tudor Tour. Sedan	520
Ford, V8—85 HP	Coupe	520
Chevrolet, Master	Bus. Coupe	525
Chevrolet, Master	Coach	535
Ford, V8—85 HP	Tudor Sedan	535
Plymouth, P3	Bus. Sedan, 2dr	550
Chevrolet, Master	Cabriolet, 2dr	555
Ford, V8—60 HP	Fordor Sedan, 4dr	555
Chevrolet, Master	Town Sedan, 2dr	560

$500 to $749—Continued

Make and Model	Body Type and No. of Doors	List Price F.O.B.
Ford, V8—85 HP	Tudor Tour. Sedan, 2dr	$ 560
Ford, V8—85 HP	De L. Coupe	565
Plymouth, De Luxe, P4	Coupe	575
Ford, V8—60 HP	Fordor Tour. Sedan, 4dr.	580
Ford, V8—85 HP	De L. Tudor Sedan, 2dr.	580
Chevrolet, Master De Luxe	Bus. Coupe	585
Chevrolet, Master De Luxe	Coach, 2dr	595
Ford, V8—85 HP	Fordor Sedan, 4dr	595
Graham Crusader, 6-85	Tour. Sedan, 2dr	595
Nash-Lafayette 400	Coupe	595
Plymouth, P3	Bus. Sedan, 4dr	595
Terraplane, De Luxe 6-71	Bus. Coupe	595
Chevrolet, Master	Sedan, 4dr	600
Ford, V8—85 HP	Tudor Tour. Sedan, 2dr	605
Terraplane, De Luxe 6-71	Coupe	605
Chevrolet, Master De Luxe	Sport Coupe	615
Chevrolet, Master De Luxe	Town Sedan, 2dr	620
Ford, V8—85	Fordor Tour. Sedan, 4dr	620
Chevrolet, Master	Sport Sedan, 4dr	625
Ford, V8—85 HP	De L. Roadster	625
Ford, V8—85 HP	Club Coupe	625
Ford, V8—85 HP	Conv. Cabriolet, 2dr	625
Graham, Crusader 6-85	Touring Sedan, 2dr	625
Plymouth, De Luxe P4	Coupe, rumble	625
Terraplane, De Luxe 6-71	Brougham, 2dr	625
Dodge	Bus. Coupe	640
Ford, V8—85 HP	Fordor Sedan, 4dr	640
Pymouth, De Luxe P4	Sedan, 2dr	640

$500 to $749—Continued

Make and Model	Body Type and No. of Doors	List Price F.O.B.
Terraplane, De Luxe 6-71	Tour. Brougham, 2dr	$ 645
Nash-La Fayette 400	Coupe	650
Plymouth, De Luxe P4	Tour. Sedan, 2dr	650
Pontiac, De Luxe 6	Bus. Coupe	650
Terraplane, De Luxe 6-71	Victoria, 2dr	650
Nash-La Fayette 400	Victoria Sedan, 2dr	655
Chevrolet, Master De Luxe	Sedan, 4d	660
Terraplane, Super 6-72	Coupe	660
Ford, V8—85 HP	DeL.FordorTour.Sed.,4dr.	665
Graham, Crusader 6-85	Tour. Sedan, 4dr	665
Studebaker, Dictator	Bus. Coupe	665
Plymouth, De Luxe P4	Sedan, 4dr	670
Terraplane, De Luxe 6-71	Sedan, 4dr	675
Ford, V8—85	De L. Phaeton	680
Plymouth, De Luxe P4	Tour. Sedan, 4dr	680
Terraplane, Super 6-72	Brougham, 2dr	680
Chevrolet, Master De Luxe	Sport Sedan, 4dr	685
De Soto	Bus. Coupe	685
Oldsmobile, Six	Bus. Coupe	685
Ford, V8—85	De L Club Cabriolet	690
Dodge	Coupe	695
Graham, Crusader 6-85	Tour. Sedan, 4dr	695
Hudson, 6-73	Bus. Coupe	695
Pontiac, De Luxe 6	Sedan, 2dr	695
Terraplane, De Luxe 6-71	Tour. Sedan, 4dr	695
Nash-La Fayette 400	Sedan, 4dr	700
Terraplane, Super 6-72	Tour. Brougham, 2dr	700
Terraplane, Super 6-72	Victoria, 2dr	700
Dodge	Sedan, 2dr	705
Chrysler, Royal Six	Bus. Coupe	715
Dodge	Tour. Sedan, 2dr	715
Studebaker, Dictator	Custom Coupe	715
Hudson, 6-73	Coupe	720
Pontiac, De Luxe 6	Sport Coupe	720
Pontiac, De Luxe 6	Tour. Sedan, 2dr	720
Graham, Cavalier 6-95	Bus. Coupe	725

(Completed on the following page)

Who's Where on the 1937 Passenger Car Price List

(Continued from the preceding page)

$500 to $749—Continued

Make and Model	Body Type and No. of Doors	List Price F.O.B.
Pontiac, De Luxe 8	Bus. Coupe	$ 725
Terraplane, Super 6-72	Sedan, 4dr	720
De Soto	Coupe	735
Hudson, 6-73	Brougham, 4dr	745
Nash-La Fayette 400	Cabriolet, 2dr	740
Oldsmobile, Six	Sedan, 2dr	740
Oldsmobile, Six	Club Coupe	740
Studebaker, Dictator	Custom Coupe	740
Auburn, 654	Brougham, 2dr	745
De Soto	Brougham, 2dr	745
Dodge	Sedan, 4dr	745
Graham, Cavalier 6-95	Tour. Sedan, 2dr	745
Pontiac, De Luxe 6	Sedan, 4dr	745
Studebaker, Dictator	St. R. Cus. Sedan, 2dr	745
Terraplane, Super 6-72	Tour. Sedan, 4dr	745

$750 to $999

Make and Model	Body Type and No. of Doors	List Price F.O.B.
DeSoto	Tour. Brougham, 2dr	$ 755
Dodge	Tour. Sedan, 4dr	755
Nash, Ambassador 6	Coupe	755
Pontiac, De Luxe 8	Sedan, 2dr	760
Buick, Special 40	Bus. Coupe	765
Chrysler, Royal Six	Coupe	765
Hudson, 6-73	Tour. Brougham, 2dr	765
Hudson, 6-73	Victoria Coupe	765
Oldsmobile, Six	Tour. Sedan, 2dr	765
Studebaker, Dictator	St. R. Crus. Sedan, 2dr	765
Hudson, De Luxe 8-74	Coupe	770
Pontiac DeLuxe, 6	Tour. Sedan, 4dr	770
Chrysler, Royal Six	Brougham, 2dr	775
Graham, Cavalier 6-95	Touring Sedan, 4dr	775
Graham, Cavalier 6-95	Tour. Sedan, 2dr	775
Graham, Cavalier 6-95	Coupe	775
Studebaker, Dictator	Custom Sedan, 4dr	775
Pontiac, De Luxe 8	Sport Coupe	780
Chrysler, Royal Six	Tour. Brougham, 2dr	785
De Soto	Sedan, 4dr	785
Oldsmobile, Eight	Bus. Coupe	785
Pontiac, De Luxe 8	Tour. Sedan, 2dr	785
Ford, V8—85	De L. Conv. Sedan	790
Hudson, 6-73	Sedan, 4dr	790
Oldsmobile, Six	Sedan, 4dr	790
Auburn, 654	Sedan	795
De Soto	Tour. Sedan, 4dr	795
Nash, Ambassador Six	Coupe, rumble	795
Nash, Ambassador Six	Victoria Sedan, 2dr	795
Packard, Six—115C	Bus. Coupe	795
Studebaker, Dictator	Cruising Sedan, 4dr	795
Hudson, De Luxe 8-74	Brougham, 2dr	800
Graham, Cavalier 6-95	Tour. Sedan, 4dr	805
Pontiac, De Luxe 8	Sedan, 4dr	805
Buick, Special 40	Sedan, 2dr	810
Pontiac, De Luxe 6	Cabriolet, 2dr	810
Chrysler, Royal Six	Sedan, 4dr	815
Hudson, 6-73	Tour. Sedan, 4dr	815
Oldsmobile, Six	Tour. Sedan, 4dr	815
Hudson, De Luxe 8-74	Victoria Coupe	820
Buick, Special 40	Sport Coupe	825
Chrysler, Royal Six	Tour. Sedan, 4dr	825
Hudson, De Luxe 8-74	Tour. Brougham, 2dr	825
Pontiac, De Luxe 8	Tour. Sedan, 4dr	830
Auburn, 654	Coupe	835
Buick, Special 40	Sedan, 2dr	835
Oldsmobile, Six	Conv. Coupe	835
Hudson, De Luxe 8-74	Sedan, 4dr	840
Oldsmobile, Eight	Sedan, 2dr	840
Oldsmobile, Eight	Club Coupe	840
Packard, Six—115C	Coupe	840
Buick, Special 40	Sedan, 4dr	845
Nash, Ambassador Six	Sedan, 4dr	845
Pontiac, De Luxe 8	Cabriolet, 2dr	850
Nash, Ambassador Eight	Coupe	855
Nash, Ambassador Six	Cabriolet, 2dr	860
Packard, Six—115C	Tour. Coupe	860
Graham, Supercharger 116	Bus. Coupe	865
Graham, Supercharger 116	Touring Sedan, 2dr	865
Hudson, De Luxe 8-74	Tour. Sedan, 4dr	865
Hudson, De Luxe 8-76	Sedan, 4dr	865
Oldsmobile, Eight	Touring Sedan, 2dr	865
Buick, Special 40	Sedan, 4dr	870
Hudson, Custom 8-75	Coupe	885
Hudson, De Luxe 8-76	Tour. Sedan, 4dr	890
Oldsmobile, Eight	Sedan, 4dr	890
Graham, Supercharger 116	Coupe	895
Graham, Supercharger 116	Tour. Sedan, 2dr	895
Graham, Supercharger 116	Tour. Sedan, 4dr	895
Hudson, Custom 8-75	Brougham, 4dr	895
Nash, Ambassador Eight	Coupe, rumble	895
Nash, Ambassador Eight	Victoria Sedan, 2dr	895
Packard, Six—115C	Sedan	895
Packard, Six—115C	Club Sedan	900
Buick, Special 40	Conv. Coupe	905
Hudson, Custom 8-75	Victoria Coupe	905
Packard, Six—115C	Tour. Sedan	910
Packard, Six—115C	Conv. Coupe	910
Oldsmobile, Eight	Tour. Sedan, 4dr	915

$750 to $999—Continued

Make and Model	Body Type and No. of Doors	List Price F.O.B.
Hudson, Custom 8-75	Tour. Brougham, 2dr	$ 920
Chrysler, Imperial 8	Bus. Coupe	925
Graham, Supercharger 116	Tour. Sedan, 4dr	925
Oldsmobile, Eight	Conv. Coupe	935
Hudson, Custom 8-75	Sedan, 2dr	940
Auburn, 654	Cabriolet	945
Nash, Ambassador 8	Sedan, 4dr	945
Packard, Eight—120C	Bus. Coupe	945
Graham, Cus. Superchrgr 120	Bus. Coupe	954
Nash, Ambassador 8	Cabriolet, 2dr	960
Chrysler, Imperial 8	Coupe	965
Chrysler, Imperial 8	Tour. Brougham, 2dr	965
Hudson, Custom 8-75	Tour. Sedan, 2dr	965
Hudson, Custom 8-77	Sedan, 4dr	965
Studebaker, President	Custom Coupe	965
Graham, Cus. Superchrgr 120	Coupe	975
Hudson, Custom 8-77	Tour. Sedan, 4dr	990
Packard, Eight—120C	Sport Coupe	990
Auburn, 654	Phaeton Sedan	995
Auburn, 852	Brougham, 2dr	995
Chrysler, Imperial 8	Tour. Sedan, 4dr	995
Graham, Cus. Superchrgr 120	Tour. Sedan, 4dr	995
La Salle, 37-50	Sport Coupe	995
Studebaker, President	Custom Coupe	995

$1000 to $1499

Make and Model	Body Type and No. of Doors	List Price F.O.B.
Buick, Century 60	Sedan, 2dr	$1000
Packard, Eight—120C	Tour. Coupe	1010
Buick, Century 60	Sport Coupe	1015
Studebaker, President	St. R. Cus. Sed., 2dr	1015
Buick, Century 60	Sedan, 2dr	1025
Graham, Cus. Superchrgr. 120	Tour. Sedan, 4dr	1025
Buick, Century 60	Sedan, 4dr	1035
Studebaker, President	St. R. Cruis. Sedan, 2dr	1035
Chrysler, Royal Six	Sedan, 7p. 4dr	1045
Packard, Eight—120C	Sedan, 4dr	1045
Studebaker. President	Custom Sedan, 4dr	1045
Packard, Eight—120C	Club Sedan	1050
Buick, Century 60	Sedan, 4dr	1060
Packard, Eight—120C	Tour. sedan, 4dr	1060
Packard, Eight—120C	Conv. Coupe	1060
Chrysler, Imperial 8	Conv. Coupe	1065
Studebaker, President	Cruising Sedan, 4dr	1065
Auburn, 852	Coupe	1085
Lincoln, Zephyr	Coupe	1090
Auburn, 852	Sedan	1095
Buick, Century 60	Conv. Coupe	1095
Buick, Special 40	Conv. Phaeton, 4dr	1145
Chrysler, Royal Six	Sedan Limousine, 4dr	1145
La Salle, 37-50	Tour. Sedan	1145
Lincoln, Zephyr	Coupe-Sedan, 2dr	1170
La Salle, 37-50	Conv. Coupe	1175
Lincoln, Zephyr	Sedan, 4dr	1190
La Salle, 37-50	Tour. Sedan, 2dr	1195
Packard, De L. 8—120CD	Tour. Coupe	1220
Auburn, 852	Cabriolet	1225
Chrysler, Royal Six	Conv. Sedan, 4dr	1245
Packard, De L. 8—120CD	Club Sedan	1260
Packard, De L. 8—120CD	Tour. Sedan	1270
Auburn, 852	Phaeton Sedan	1275
Buick, Roadmaster 80	Sedan, 4dr	1275
Buick, Century 60	Conv. Phaeton, 2dr	1345
Lincoln, Zephyr	Twn. Limousine, 4dr	1350
Packard, Eight—120C	Conv. Sedan	1355
Buick, Roadmaster 80	Formal Sedan, 4dr	1395
Chrysler, Imperial 8	Conv. Sedan, 4dr	1395
Auburn, Supercharger 852	Brougham, 2dr	1445
Cadillac, V8—60	Sport Coupe	1445
Chrysler, Airflow	Sedan, 4dr	1475
Chrysler, Airflow	Coupe	1475
La Salle, 37-50	Conv. Sedan, 4dr	1485

$1500 to $1999

Make and Model	Body Type and No. of Doors	List Price F.O.B.
Auburn, Supercharger 852	Sedan	$1545
Auburn, Supercharger 852	Coupe	1545
Cadillac, V8—60	Touring Sedan, 4dr	1545
Buick, Roadmaster 80	Phaeton, 4dr	1565
Cadillac, V8—60	Conv. Coupe	1575
Auburn, 852	Sedan	1595
Auburn, Supercharger 852	Cabriolet	1675
Packard, De L. 8—120CD	Tour. Sedan	1690
Auburn, Supercharger 852	Phaeton Sedan	1725
Buick, Limited 90	Sedan, 4dr	1725
Packard, De L. 8—120CD	Tour. Limousine	1840
Cadillac, V8-60	Conv. Sedan, 4dr	1885
Buick, Limited 90	Formal Sedan, 4dr	1895
Buick, Limited 90	Sedan, 4dr	1895
Chrysler, Cus. Imper. 8	Sedan, 7p., 4dr	1895

$1500 to $1999—Continued

Make and Model	Body Type and No. of Doors	List Price F.O.B.
Cadillac, V8—65	Tour. Sedan, 4dr	$1945
Buick, Limited 90	Limousine, 4dr	1995
Chrysler, Cus. Imper. 8	Sedan Limousine, 4dr	1995
Cord	West'er Sedan, 4dr	1995

$2000 to $2999

Make and Model	Body Type and No. of Doors	List Price F.O.B.
Auburn, Supercharger 852	Sedan	$2045
Cord	Beverly Sedan, 4dr	2095
Cord	Conv. Coupe	2145
Cord	Conv. Phae. Sedan, 2dr	2195
Auburn, Supercharger 852	Speedster	2245
Packard, Super 8—1500	Tour. Sedan	2335
Packard, Super 8—1501	Coupe	2420
Cadillac, V8—70	Tour. Sedan, 4dr	2445
Packard, Super 8—1501	Coupe, rumble	2510
Packard, Super 8—1501	Club Sedan	2530
Packard, Super 8—1501	Tour. Sedan, 4dr	2535
Packard, Super 8—1502	Bus. Sedan	2580
Cadillac, V8—75	Tour. Sedan, 4dr	2645
Cadillac, V8—70	Sport Coupe	2645
Packard, Super 8—1501	Coupe Roadster	2680
Packard, Super 8—1502	Tour. Sedan, 4dr	2705
Packard, Super 8—1502	Bus. Limousine	2715
Cadillac, V8—70	Conv. Coupe	2745
Cadillac, V8—75	Tour. Sedan, 4dr	2795
Cadillac, V8—70	Conv. Sedan, 4dr	2795
Packard, Super 8—1502	Tour. Limousine, 4dr	2840
Cadillac, V8—75	Imp. Tour. Sedan, 4dr	2995

$3000 to $4999

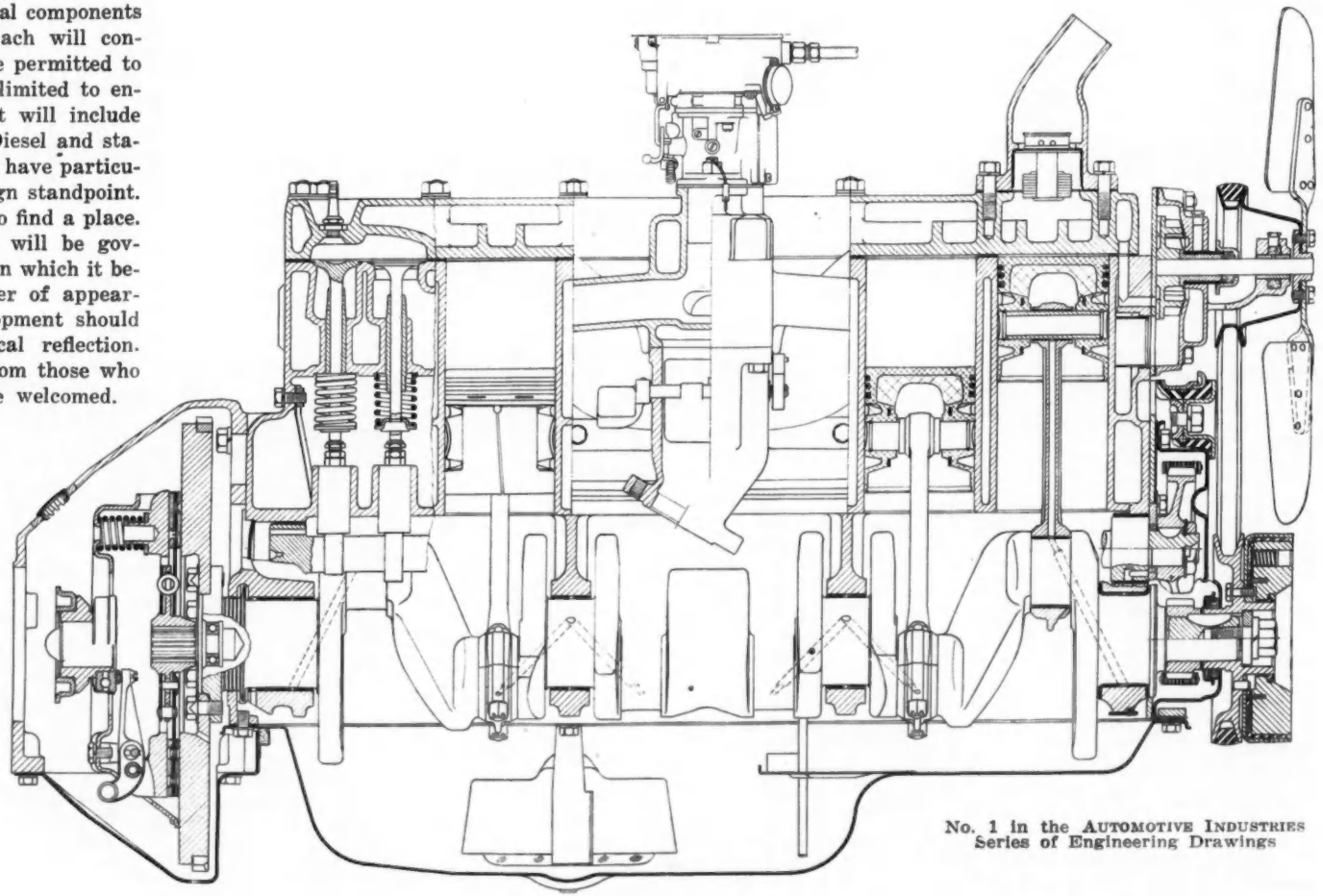
Make and Model	Body Type and No. of Doors	List Price F.O.B.
Cadillac, V8—75	Town Sedan, 4dr	$3145
Packard, Super 8—1501	Victoria	3150
Pierce-Arrow, 8—1701	Coupe	3195
Pierce-Arrow, 8—1701	Sedan	3195
Packard, Super 8—1501	Formal Sedan	3235
Pierce-Arrow, 8—1701	Conv. Roadster	3295
Pierce-Arrow, 8—1701	Club Sedan	3295
Cadillac, V12—85	Tour. Sedan, 4dr	3345
Packard, Super 8—1502	Conv. Sedan	3350
Packard, Twelve—1507	Coupe, rumble	3420
Cadillac, V8—75	Conv. Sedan, 4dr	3445
Pierce-Arrow, 8—1701	Formal Sedan	3445
Pierce-Arrow, 8—1701	Club Berline	3445
Packard, Twelve—1507	Club Roadster	3450
Packard, Twelve—1506	Tour. Sedan	3490
Cadillac, V12—85	Tour. Sedan, 4dr	3495
Cadillac, V8—75	Formal Sedan, 4dr	3495
Pierce-Arrow, 8—1701	Sedan, 7pass.	3500
Packard, Twelve—1507	Tour. Sedan	3560
Packard, Twelve—1507	Coupe, rumble	3590
Pierce-Arrow, 8—1701	Enc. Dri. Limousine	3650
Packard, Twelve—1507	Club Sedan	3660
Cadillac, V12—85	Imp. Tour Sedan, 4dr	3695
Pierce-Arrow, 12—1702	Coupe	3695
Pierce-Arrow, 12—1702	Sedan	3695
Pierce-Arrow, 12—1702	Conv. Roadster	3795
Pierce-Arrow, 12—1702	Club Sedan	3795
Cadillac, V12—85	Town Sedan, 4dr	3845
Packard, Twelve—1508	Tour. Sedan	3885
Pierce-Arrow, 12—1702	Club Berline	3945
Pierce-Arrow, 12—1702	Formal Sedan	3945
Pierce-Arrow, 12—1702	Sedan, 7pass.	4000
Packard, Twelve—1508	Tour. Limousine	4085
Cadillac, V12—85	Conv. Sedan, 4dr	4145
Pierce-Arrow, 12—1702	Enc. Dri. Limousine	4150
Cadillac, V12—85	Formal Sedan, 4dr	4195
Packard, Twelve—1507	Formal Sedan	4260
Packard, Twelve—1507	Victoria	4490
Cadillac, V8—75	Town Car., 4dr	4545
Pierce-Arrow, 12—1702	Conv. Sedan	4600
Packard, Twelve—1508	Conv. Sedan	4650
Pierce-Arrow, 12—1703	Sedan	4795
Packard, Super 8—1501	A. W. Cabriolet, Le B.	4850
Packard, Super 8—1502	A. W. Town Car, Le B	4990
Pierce-Arrow, 12—1703	Enc. Dri. Limousine	4995

$5000 and over

Make and Model	Body Type and No. of Doors	List Price F.O.B.
Cadillac, V12—85	Town Car, 4dr	$5245
Pierce-Arrow, 8—1701	Brunn. Twn. Brougham	5295
Packard, Twelve—1507	A. W. Cabriolet, Le B	5700
Pierce-Arrow, 12—1702	Brunn. Twn. Brougham	5795
Packard, Twelve—1508	A. W. Town Car, Le B	5900
Cadillac, V16—90	Sedan, 4dr	7350
Cadillac, V16—90	Imperial Sedan, 4dr	7550

1937 Packard "Six" Engine, 237 cu. in. Displacement

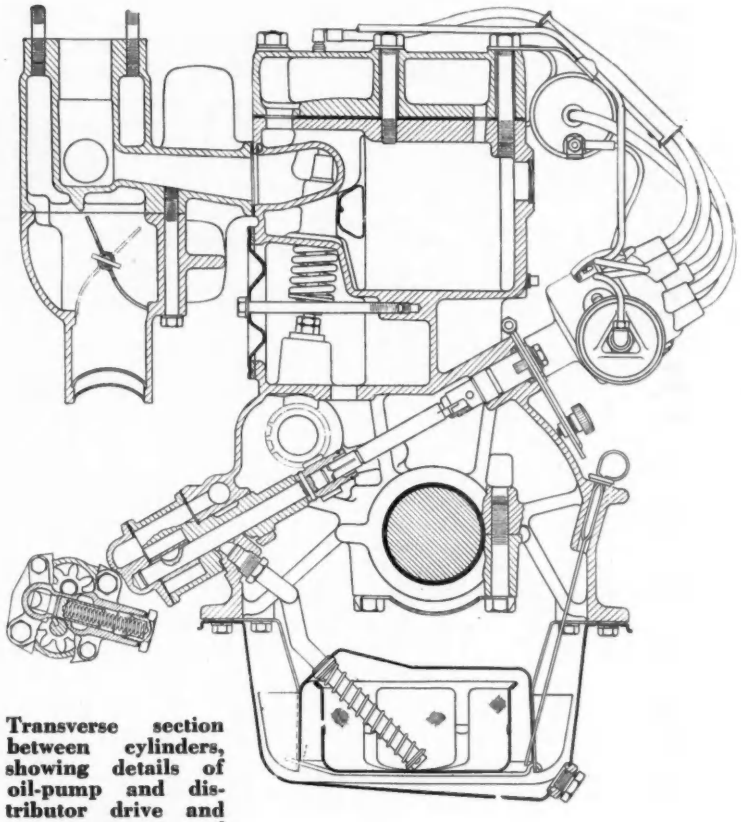
WITH this issue, AUTOMOTIVE INDUSTRIES begins regular publication of large, detailed section drawings of new engines and important mechanical components for automotive apparatus. Each will contain as much detail as we are permitted to show. The series will not be limited to engines for passenger cars, but will include truck, bus, tractor, aircraft, Diesel and stationary engines which seem to have particular significance from the design standpoint. Foreign developments will also find a place. Presentation of the material will be governed somewhat by the order in which it becomes available, and the order of appearance, or omission of a development should not be construed as a critical reflection. Comments and suggestions from those who find this series useful will be welcomed.



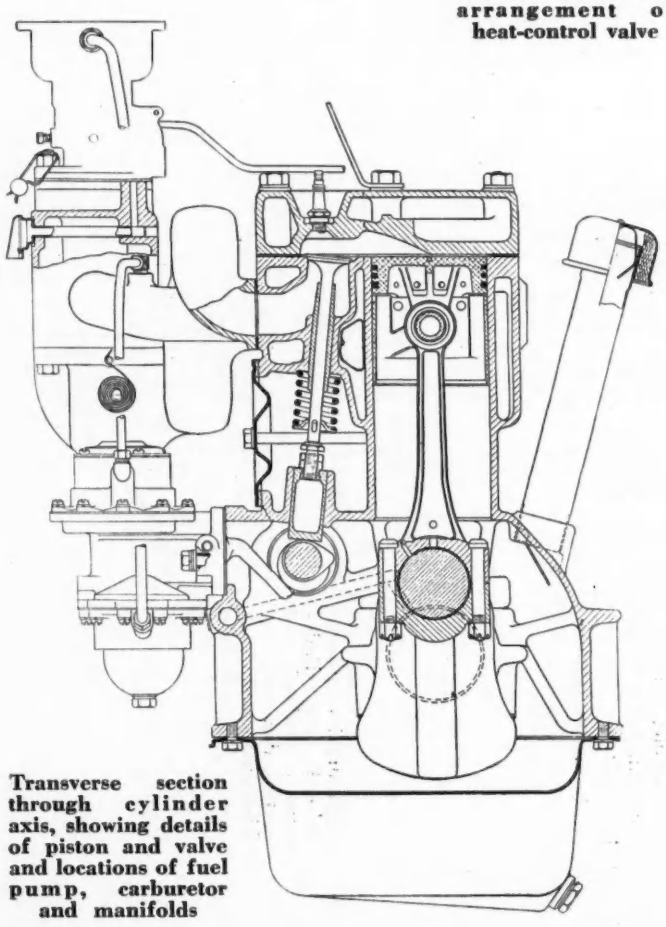
Longitudinal section of Packard six-cylinder engine with clutch and vibration damper. Note rubber-cushioned front support at midheight

No. 1 in the AUTOMOTIVE INDUSTRIES Series of Engineering Drawings

THE engine of the new Packard line is a six-cylinder L-head design of 3 7/16-in. bore and 4¼-in. stroke, which makes its piston displacement 237 cu. in. With a compression ratio of 6.3 to 1 it develops 100 hp. at 3600 r.p.m., its specific output thus being slightly over 0.42 hp. per cu. in. The pistons are of the Nelson Autothermic type in which the heat expansion is controlled by parallel struts of steel and aluminum. Complete with rings and pin the piston weighs 25.4 oz. Each piston carries two ⅛-in. compression rings and one 3/16-in. oil-control ring. All of the rings are of Perfect-Circle make, the compression rings being the 70 and the oil ring the X-90. The piston pin, as shown in the longitudinal section is of the floating type and is held from drifting by snap rings let into grooves cut in the bores of the piston bosses. It is of ⅞-in. diameter. Connecting rods have a center-to-center length of 7 11/16 in. and weigh 32½ oz. each.



Transverse section between cylinders, showing details of oil-pump and distributor drive and arrangement of heat-control valve



Transverse section through cylinder axis, showing details of piston and valve and locations of fuel pump, carburetor and manifolds

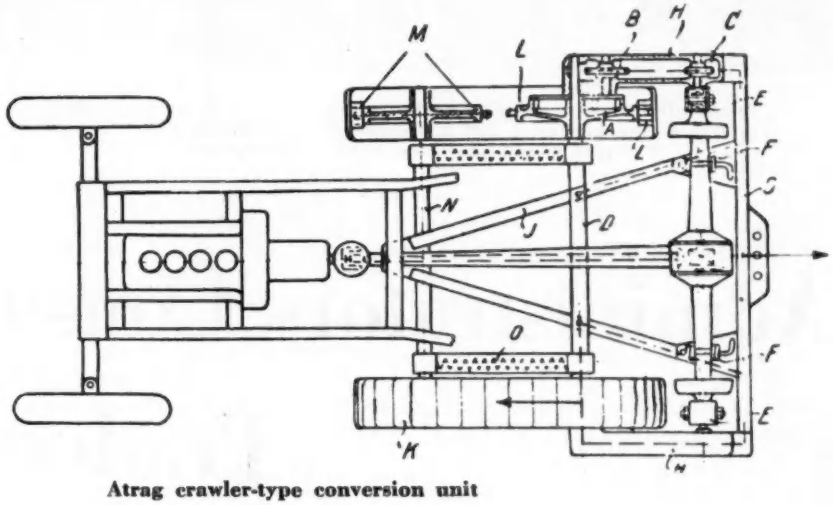
The crankshaft is supported in four main bearings of 2¾ in. diameter. These are of the steel-back, babbitt-lined type. Inlet valves are made of chrome-nickel steel and have a head diameter of 1.575 in., while exhaust valves are of austenitic steel and have a head diameter of 1.406 in. Valves are operated from the camshaft directly through thimble-shaped cam followers. Valve pockets are completely water-jacketed and, as shown in the transverse section taken between cylinders, water is carried directly to the exhaust-valve pockets by an internal water-distributing pipe. A down-draft Chandler-Groves carburetor is fitted and has the air cleaner and inlet silencer (not shown in the illustrations) mounted on top of it. In the transverse section through a cylinder axis the fuel pump can be seen located at the side of the crankcase. This view also shows the location of the spiral bimetallic heat-control thermostat mounted on the stem of the heat-control valve.

Tractor Axle

Converts passenger cars or trucks into wheeled or crawler-type tractors

CONVERSION units for converting truck or passenger cars into wheeled or crawler-type tractors have been developed in Germany, where they are being manufactured under the trade name "Atrag" by the Atrag Auto-und Tractoren Ausrüstung, G.m.b.H., of Berlin. Dr. Otto Bernhard, general manager of this firm, is at present in this country and is endeavoring to interest American manufacturers in the production of the equipment here.

While conversion units of this general type have been manufactured here in the past, the Atrag has a number of original features which are covered by U. S. and other patents. From the drawings reproduced herewith it will be seen that the rear wheels of the passenger car are removed and the axle shafts are coupled to the power-receiving shafts of the conversion unit by couplings of a design which compensates for a certain degree of misalignment. Power is transmitted from the receiving shafts of the conversion unit by roller chain to short intermediate shafts, and from the latter by spur pinion and internal gear to the traction wheels of the unit. The wheeled-tractor conversion unit, called a "Tractor Axle" by the manufacturer, consists of a driving axle D, a housing H designed as frame side plates, a rear cross member G and the struts J, which together with the cross member form a triangular frame. The crawler conversion unit, called the "Auto-Crawler" by the manufacturer, in addition comprises an axle N with guide wheels M.



Atrag crawler-type conversion unit

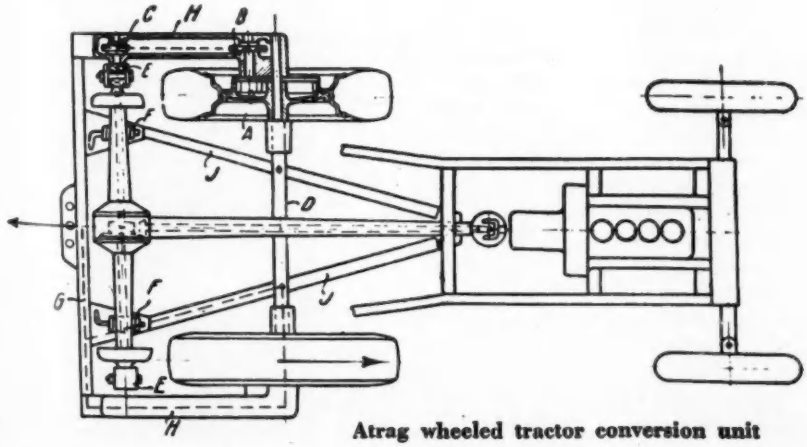
For plowing, or where heavy loads are to be transported over soft ground, a reduction ratio of between 5:1 and 8:1 must be used. For ordinary road transportation, where speed is a more important consideration, a reduction ratio of 1½:1 is more suitable, and in that case the internal-gear reduction is dispensed with and the reduction is effected by the chain gear alone.

The frame of the conversion unit it rigidly connected to the rear-axle housing of the automobile at two points by means of U bolts, leather linings or fillers being used. These are the only rigid connections between the car and the conversion unit. At its forward end the triangular frame is supported from a cross member of the car frame by means of a swivel joint. which latter facilitates the installation of the unit, making accurate machined fits unnecessary.

The special feature of the Atrag unit is that instead of the driving sprockets being secured directly to the axle ends, they are secured to short shafts supported in bearings in the housing, whereby the axle bearings are relieved of loads due to chain tension, etc.

Drawbar connection is made to the cross member G of the conversion-unit frame. The draft originates at the tractor wheels or tractor chain and is transmitted directly to the drawbar, so that it does not stress any parts of the vehicle itself. The crawler-type conversion unit is intended mainly for use in roadless districts and for agricultural work in swampy country for breaking new ground, etc. For plowing land

(Turn to page 728, please)



Atrag wheeled tractor conversion unit

Practically every national organization interested in promoting safety on the highways was represented at the annual meeting of National Assoc. of Motor Vehicle Administrators.

Administrators Consider Coach Trailer Regulations

By

Philip H. Smith

IF you can imagine a composite motor vehicle labeled Safety, powered by multi-cylinder engine representing coordinated effort, traveling a road marked Uniform Laws and dragging behind it the dim outline of a tourist trailer, you will have an animated mental picture of the fourth annual meeting of the National Association of Motor Vehicle Administrators.

Safety and more safety was the keynote of this Hot Springs, Ark., meeting which took place Nov. 12 to 14. Cooperative striving to lower accidents and fatalities featured every statement of the three-day program.

The meeting might be said to have featured two pyrotechnic displays not listed on the program. The first was touched off by a discussion about lighting and gave off a little heat as well as illumination. The second display was equally illuminating, but markedly different in the brilliance of its effect.

What we might term the "fuse" as made of accident statistics, presented by one of the members, which showed that there had been a sharp increase in pedestrians killed by motor vehicles during the night while daytime fatalities of the same nature had decreased. It was further stated that 43 per cent of all fatal accidents were to be accounted for by this single classification of "night walking" and that the blame could be placed upon headlights and excessive speeds.

Neither the public nor the automobile manufacturer had awakened to the seriousness of death from improper lighting, said this speaker. The headlamp situation, he went on to say, is more chaotic today than at any time since 1924. It has been getting progressively worse because the engineers in charge of lamp design have let the demands for style and appearance override the necessities for proper lighting, with the result that the product has become poorer. The headlamps of today are too complex in design to allow for any needed adjustments and are far beyond any hope of regulation by those to whom the duty of adjustment has been delegated.

More than one administrator held this to be absolutely true and they were in unanimous agreement that something must be done about the problem of glare. Prompt action, they felt to be imperative because there was a movement toward increasing candlepower to make fast night driving possible, and this they regarded as undesirable. A suggestion that depressing the beam upon meeting an oncoming vehicle would mitigate the evil met with little response, it being held that the repetitious act would become tiresome and hence be neglected. Furthermore, that there was an interim period just prior to elevating the beam when illumination

Trailer Coach Manufacturers Association and National Association of Motor Vehicle Administrators to cooperate on safety features and regulation of house trailers.

Speakers at the annual meeting pointed out that headlamps of cars and trucks are too complex in design to allow for needed adjustments and far beyond the hope of regulation.

A differential in speed limits for day and night driving was proposed pending the development of satisfactory regulation and equipment to meet the emergency.

was inadequate for fast night driving.

Several of the members felt that a choice must be made between high speed coupled with glare and lower speeds coupled with safe and sane lighting, their reason being that high speed night driving demanded adequate far vision only to be had with powerful beams which connote glare. And if there was any question as to what administrators thought about it after the discussion had ended, it was settled by a resolution which urged the Committee on Lighting to consider the advisability of establishing a differential between night and day speed limits, while they were considering recommendations for lighting equipment to meet the emergency.

From the very first hour of the meeting there were rumblings about the tourist trailer. It was listed as a topic on the program, but it came in for attention ahead of schedule. The enforcement officers among the members got busy on it the first day. Perhaps more than any other members, this group gets the actualities of the trailer on the highway and they groaned at the mere mention of it. Their criticisms of this new creation were concerned wholly with the potential accident element. They objected to trailers that broke down on the road, that whipped from side to side covering more than a single driving lane, that came unhitched and attacked passing vehicles, and they held that the disposal of sewage on the highways went beyond a matter of poor taste. "The bones of trailers that couldn't take it litter the plains of our state," said one official from the Southwest."

The more the discussion progressed, the more apparent it became that what enforcement officers were indicting was not the manufactured trailer of commerce but the home-made contraption. They made no distinction at the outset, but later freely admitted that it was the backyard school of design that was bringing the trailer into disrepute and a similar thought emanated from the other members.

In a resolution drawn up by the enforcement officers and submitted to the association delegates as a body, it was stipulated that tourist trailers should have adequate brakes, lighting and hitches and be equipped with safety glass. It was urged that trailers be marked for identification purposes and to assist in registration, much as automobiles are, and it was also believed that a scientific study should be made to determine the proper ratio between speed and load. Finally, they recommended that trailers should be banned from cars lacking adequate brakes.

Then came the second bit of fireworks.

At the annual dinner President Lew E. Wallace announced that the Trailer Coach Manufacturers Association had

Prof. Harry DeSilva of Harvard College and Prof. Alvhh Lauer of Iowa State University, both presented papers and demonstrated driver testing equipment.

sent a representative to say to the administrators in effect, "Tell us what you think a trailer ought to be and we'll build the kind of a trailer you want." It was a sincere expression, a cooperative one, welcomed by the administrators even though as President Wallace said, "We've been put on the spot. Now it is up to us to do something," for it was recognized as an opportunity to work toward a common objective of safety before the problem got out of hand.

Shortly before the meeting came to a close, A. W. Koehler, executive secretary, presented his report on House Trailer Recommendations. This consisted of a reading of suggestions and recommendations from administrators from most of the states of the Union and the consensus of opinion on this subject can best be summarized by a resolution which was read and adopted, the same resolution that was adopted by the Eastern Conference earlier in the year.

"Therefore, be it resolved that such a trailer be so constructed, attached and loaded that:

"1. It is capable of safely carrying the load to which it is subjected.
"2. It is stable when loaded or unloaded.
"3. It may be drawn safely at normal speeds or when accelerating or decelerating without swaying or otherwise endangering other users of the highways.
"4. The attachment to the driving vehicle is secure.
"5. The braking, lighting and other equipment renders its use safe.
"6. Its dimensions or those of any attachments do not interfere with the safe operation of any vehicle on the highway.
"7. The operation of the drawing vehicle is not made hazardous by reason of interference with rear vision or by any other reason."

The subject of house trailers was dismissed with the decision to appoint a committee to go into the subject thoroughly to determine needs, and a resolution to cooperate with public health officials of the states on matters of sanitation.

Safety was the force behind the majority of matters before the gathering, but there were a few exceptions. It was brought to the attention of the delegates by one of the members that advantages would be had from the issuance of certificates of manufacture, or car "birth certificates," to accompany a vehicle from the day it leaves the factory until it is junked, upon which assignment of ownership could be noted. Certification of ownership at the present time is limited to a bill of sale given by the dealer; this plan would go back of the dealer to the manufacturer and eliminate any chance of a dealer selling a financed car and absconding to leave the purchaser with a shaky title.

Sample certificates were shown to the gathering with comment upon its use and a resolution was passed that the various merits and demerits of the idea be considered by committee.

Both Professor Harry DeSilva of the Harvard Bureau of Street Traffic Research and Prof. Alvhh Lauer of Iowa State University, presented papers on driving tests, and both had testing equipment at the hotel where it was in constant use by members of the association as well as miscellaneous guests. Dr. DeSilva announced that recent experiments carried out in California proved there to be many other factors beside driving skill that influenced accident rates, notably race, place of birth, marital and economic state. He stressed that he was not advocating the use of instruments for testing prospective drivers, but rather to build up a factual background.

Warning against the over-development of instruments, Dr. Lauer stated that the goal of equipment design should be to obtain reliability, validity, simplicity, inexpensiveness and usability. He reported in the order of their importance six factors as the best relative index of keeping out of accidents. They are: experience (without relation to age), number of cars driven, years of driving, strength of driver, actual manipulation of driving controls, and vision. He declared, on the other hand, that color vision, reaction time and hearing were valueless. Dr. Lauer was in constant attendance and rated the results of those who went through the entire driving test.

Practically every national organization interested in promoting safety on the highways took part in the three-day program. In addition, the state of Arkansas was represented by its Governor, the honorable J. Marion Futrell, who gave the address of welcome to the members. Governor Futrell urged unceasing effort to bring about uniform motor vehicle laws and stressed the necessity for creating a strong public sentiment for such uniformity. Senator Emmett O'Neal of Kentucky, chairman of the Roper Committee on Uniform Motor Vehicle Laws and Traffic Ordinances, proffered assistance.

At the close of the sessions new officers of the association were elected. The new president is John Q. Rhodes, Jr., of Virginia; vice-president, D. B. Hutchins of Arizona; secretary and treasurer, Arthur Magee of New Jersey.

Pollution of Sea Water with Petroleum Products

A PAMPHLET bearing the title "Pollution de la Mer par les Hydrocarbures" has been published by the League of Nations, Geneva, Switzerland, and sells at 5 francs per copy. It contains the results of an inquiry made among member states as to the damage caused by the discharge of petroleum products on the high seas by motor freighters and fishing vessels, loss through collisions or groundings of oil tankers, the spreading of oil on the waves in the case of ships in distress, and the accidental discharge of waste from refineries into the estuaries of rivers. Such discharge of petroleum products causes a pollution which not only is detrimental to fishes and sea birds but also makes itself unpleasantly felt along the waterfronts at sea ports, at bathing beaches and in fishing establishments.

Two different remedies are suggested, one consisting in the creation of zones of sufficient width (50 miles has been proposed), beginning at the sea shore, within which the discharge of petroleum products or of water polluted with petroleum products would be prohibited. The other suggested remedy is the installation of separators on board of all vessels.

The problem has been under consideration ever since 1926, but no effective remedy has been found so far. The questionnaire referred to in the foregoing was addressed to members of the League in 1934, on British initiative. It related to the importance of the damage caused on the one hand and to the possibility of making the proposed remedies obligatory, on the other.

That damage is being caused by petroleum pollution to marine fauna and flora was generally admitted, but as to the extent of this damage opinions varied widely. Most of the countries that replied were opposed to the compulsory installation of oil separators, as too expensive. On the other hand, the proposal of zones in which the discharge of petroleum products would be prohibited is said to merit a thorough investigation. It is pointed out in this connection that the width of the zones should vary, as their effectiveness would depend on ocean currents, winds, temperatures, etc.

Prices, Weights and Wheelbases of 1937 Passenger Cars

BODY, MAKE AND MODEL	No. of Pass.	No. of Doors	Price	Ship. Weight	Wheelbase	R. A. Gear Ratio
AMERICAN BANTAM						
Business Coupe	1	2	$335	....	....	....
Standard Coupe	2	2	365	....	....	....
Roadster	2	2	385	....	....	....
De Luxe Coupe	3	2	385	....	....	....
Custom Roadster	2	2	445	....	....	....
AUBURN 654						
Brougham	5	2	745	3214	120	4.44
Sedan	5	..	795	3219	120	4.44
Cabriolet	4	..	945	3182	120	4.44
Phaeton Sedan	5	..	995	3248	120	4.44
Coupe	2-4	..	835	3105	120	4.44
852						
Brougham	5	2	995	3475	127	4.08
Sedan	5	..	1095	3580	127	4.08
Cabriolet	4	..	1225	3415	127	4.08
Phaeton Sedan	5	..	1275	3565	127	4.08
Coupe	2-4	..	1085	3395	127	4.08
Sedan	5	..	1595	3751	127	4.08
852 Supercharged						
Brougham	5	2	1445	3810	127	4.08
Sedan	5	..	1545	3915	127	4.08
Cabriolet	4	..	1675	3730	127	4.08
Phaeton Sedan	5	..	1725	3880	127	4.08
Coupe	2	..	1545	3693	127	4.98
Speedster	2	..	2245	3700	127	4.08
Sedan	5	..	2045	4090	127	4.08
BUICK Special 40						
Sedan	5	2	810	3484	122	4.40
Sedan, Trunk	5	2	835	3479	122	4.40
Sedan	5	4	845	3509	122	4.40
Sedan, Trunk	5	4	870	3519	122	4.40
Business Coupe	2	2	765	....	122	4.40
Sport Coupe	2-4	2	825	....	122	4.40
Conv. Coupe	2-4	2	905	....	122	4.40
Conv. Phaeton	5	4	1145	....	122	4.40
Century 60						
Sedan	5	2	1000	....	126	3.90
Sedan, Trunk	5	2	1025	....	126	3.90
Sedan	5	4	1035	....	126	3.90
Sedan, Trunk	5	4	1060	....	126	3.90
Sport Coupe	2-4	2	1015	....	126	3.90
Conv. Coupe	2-4	2	1095	....	126	3.90
Conv. Phaeton	5	4	1345	....	126	3.90
Roadmaster 80						
Phaeton, Trunk	6	4	1565	....	131	4.22
Sedan, Trunk	6	4	1275	4131	131	4.22
Formal Sed., Trk.	6	4	1395	4216	131	4.22
Limited 90						
Sedan, Trunk	8	4	1895	4541	138	4.62
Limousine, Trunk	8	4	1995	4596	138	4.62
Sedan, Trunk	6	4	1725	4461	138	4.62
Formal Sed., Trk.	6	4	1895	4541	138	4.62
CADILLAC—V-8 Series 60						
Sport Coupe	2-4	2	1445	....	124	3.69
Touring Sedan	5	4	1545	....	124	3.69
Conv. Coupe	2-4	2	1575	....	124	3.69
Conv. Sedan	5	4	1885	....	124	3.69
Series 65						
Touring Sedan	5	4	1945	....	131	4.30
Series 70						
Sport Coupe	2-4	2	2645	....	131	4.30
Touring Sedan	5	4	2445	....	131	4.30
Conv. Coupe	2-4	2	2745	....	131	4.30
Conv. Sedan	5	4	2795	....	131	4.30
Series 75						
Touring Sedan	5	4	2645	....	138	4.60
Touring Sedan	7	4	2795	....	138	4.60
Imp. Sedan	7	4	....	....	138	4.60
Imp. Tour. Sedan	7	4	2995	....	138	4.60
Town Sedan	5	4	3145	....	138	4.60
Formal Sedan	5	4	3495	....	138	4.60
Conv. Sedan	5	4	3445	....	138	4.60
Town Car	5	4	4545	....	138	4.60
V12, Series 85						
Touring Sedan	5	4	3345	....	138	4.60
Touring Sedan	7	4	3495	....	138	4.60
Imp. Sedan	7	4	....	....	138	4.60
Imp. Tour. Sedan	7	4	3695	....	138	4.60
Town Sedan	5	4	3845	....	138	4.60
Formal Sedan	5	4	4195	....	138	4.60
Conv. Sedan	5	4	4145	....	138	4.60
Town Car	7	4	5245	....	138	4.60
V16, Series 90						
Sedan	7	4	7350	....	154	4.64
Imperial Sedan	7	4	7550	....	154	4.64
CHEVROLET Master						
Sedan	5	4	600	....	112½	3.73
Coach	5	2	535	....	112½	3.73
Town Sedan	5	2	560	....	112½	3.73
Sport Sedan	5	4	625	....	112½	3.73
Bus. Coupe	2	2	525	....	112½	3.73
Cabriolet	4	2	555	....	112½	3.73
Master De L.						
Sedan	5	4	660	....	112½	4.22
Coach	5	2	595	....	112½	4.22
Town Sedan	5	2	620	....	112½	4.22
Sport Sedan	5	4	685	....	112½	4.22
Bus. Coupe	2	2	585	....	112½	4.22
Sport Coupe	2-4	2	615	....	112½	4.22
CHRYSLER Royal Six, C16						
Bus. Coupe	2	2	715	....	116	4.10
Coupe	2-4	2	765	....	116	4.10
Tour. Brougham	5	2	785	....	116	4.10
Brougham	5	2	775	....	116	4.10
Tour. Sedan	5	4	825	3049	116	4.10
Sedan	5	4	815	....	116	4.10

BODY, MAKE AND MODEL	No. of Pass.	No. of Doors	Price	Ship. Weight	Wheelbase	R. A. Gear Ratio
CHRYSLER—Cont.						
Sedan	7	4	1045	....	133	....
Sedan Limousine	7	4	1145	....	133	....
Imp. Eight, C14						
Bus. Coupe	2	2	925	....	121	4.10
Coupe	2-4	2	965	....	121	4.10
Tour. Brougham	5	2	965	....	121	4.10
Tour. Sedan	5	4	995	....	121	4.10
Conv. Coupe	2-4	2	1065	....	121	4.10
Conv. Sedan	5	4	1395	....	121	4.10
Cust. Imp., C15						
Sedan	7	4	1895	....	140	4.55
Sedan Limousine	7	4	1995	....	140	4.55
Airflow, C17						
Coupe	3-6	2	1475	4128	128	4.30
Sedan	6	4	1475	4203	128	4.30
CORD						
Westchester Sed.	5	4	1995	3715	125	2.75
Beverly Sedan	4	4	2095	3740	125	2.75
Conv. Coupe	2	2	2145	3815	125	2.75
Conv. Phae. Sed.	5	2	2195	3864	125	2.75
DE SOTO						
Bus. Coupe	3	2	685	2954	116	4.10
Coupe	3-5	2	735	3004	116	4.10
Brougham	6	2	745	3039	116	4.10
Tour. Brougham	6	2	755	....	116	4.10
Sedan	6	4	785	3039	116	4.10
Tour. Sedan	6	4	795	3064	116	4.10
Conv. Coupe	3-5	2	....	....	116	4.10
Conv. Sedan	5	4	....	....	116	4.10
Sedan	7	4	....	....	116	4.10
DODGE						
Bus. Coupe	2	2	640	2822	115	4.10
Coupe	2-4	2	695	2882	115	4.10
Conv. Coupe	2-4	2	....	....	115	4.10
Sedan	5	2	705	2912	115	4.10
Tour. Sed., Trunk	5	2	715	2902	115	4.10
Sedan	5	4	745	2912	115	4.10
Tour. Sed., Trunk	5	4	755	2912	115	4.10
Sedan	7	4	....	....	132	4.10
Conv. Sedan	5	4	....	....	115	4.10
Limousine	5	4	....	....	115	4.10
FORD—V8-60						
Tudor Sedan	5	2	495	....	112	4.44
Tudor Tour. Sed.	5	2	520	....	112	4.44
Fordor Sedan	5	4	555	....	112	4.44
Fordor Tour. Sed.	5	4	580	....	112	4.44
Coupe	2-4	2	480	....	112	4.44
Standard V8-85						
Tudor Sedan	5	2	535	....	112	3.78
Tudor Tour. Sed.	5	2	560	....	112	3.78
Fordor Sedan	5	4	595	....	112	3.78
Fordor Tour. Sed.	5	4	620	....	112	3.78
Coupe	2-4	2	520	....	112	3.78
De Luxe V8-85						
Tudor Sedan	5	2	580	....	112	3.78
Fordor Sedan	5	4	640	....	112	3.78
Roadster	2	2	625	....	112	3.78
Phaeton	5	4	680	....	112	3.78
Coupe	2-4	2	565	....	112	3.78
Tudor Tour. Sed.	5	2	605	....	112	3.78
Fordor Tour. Sed.	5	4	665	....	112	3.78
Cabriolet	..	2	690	....	112	3.78
Conv. Sedan	5	..	790	....	112	3.78
Conv. Cabriolet	..	2	625	....	112	3.78
Club Coupe	2-4	2	625	....	112	3.78
GRAHAM Crusader Series 6-85						
Touring Sedan	5	2	895	2860	111	4.55
Tour. Sed., Trunk	5	2	625	2675	111	4.55
Touring Sedan	5	4	665	2695	111	4.55
Tour. Sed., Trunk	5	4	695	2715	111	4.55
Cavalier Series 6-95						
Bus. Coupe	3	2	725	2815	116	4.45
Coupe	3-5	2	775	2880	116	4.45
Touring Sedan	5	2	745	2930	116	4.45
Tour. Sed., Trunk	5	2	775	2930	116	4.45
Touring Sedan	5	4	775	2960	116	4.45
Tour. Sed., Trunk	5	4	805	2945	116	4.45
Supercharger Series 116						
Bus. Coupe	3	2	865	2975	116	4.27
Coupe	3-5	2	895	3040	116	4.27
Touring Sedan	5	2	865	3105	116	4.27
Tour. Sed., Trunk	5	2	895	3105	116	4.27
Tour. Sed., Trunk	5	4	925	3125	116	4.27
Touring Sedan	5	4	895	3125	116	4.27
Custom Super. Series 120						
Bus. Coupe	3	2	954	3020	120	4.27
Coupe	3-5	2	975	3055	120	4.27
Touring Sedan	5	4	995	3200	120	4.27
Tour. Sed., Trunk	5	4	1025	3200	120	4.27
HUDSON 6-73						
Bus. Coupe	2	2	695	....	122	4.11
Coupe	3	2	720	....	122	4.11
Brougham	6	4	740	....	122	4.11
Tour. Brougham	6	2	765	....	122	4.11
Vict. Coupe	2-4	2	765	....	122	4.11
Sedan	6	4	790	....	122	4.11
Tour. Sedan	6	4	815	....	122	4.11
De Luxe 8-74						
Coupe	3	2	770	....	122	4.11
Brougham	6	2	800	....	122	4.11
Vict. Coupe	3	2	820	....	122	4.11
Tour. Brougham	6	2	825	....	122	4.11
Sedan	6	4	840	....	122	4.11
Tour. Sedan	6	4	865	....	122	4.11
Custom 8-75						
Coupe	3	2	885	....	122	4.11

BODY, MAKE AND MODEL	No. of Pass.	No. of Doors	Price	Ship. Weight	Wheelbase	R. A. Gear Ratio
HUDSON—Cont.						
Brougham	6	4	895	....	122	4.11
Vict. Coupe	3	2	905	....	122	4.11
Tour. Brougham	2-4	2	920	....	122	4.11
Sedan	3	2	940	....	122	4.11
Tour. Sedan	6	2	965	....	122	4.11
De Luxe 8-76						
Sedan	6	4	865	....	129	4.11
Tour. Sedan	6	4	890	....	129	4.11
Custom 8-77						
Sedan	6	4	985	....	129	4.11
Tour. Sedan	6	4	990	....	129	4.11
LA SALLE 37-50						
Sport Coupe	2-4	2	995	....	124	3.92
Touring Sedan	5	2	1145	....	124	3.92
Touring Sedan	5	4	1195	....	124	3.92
Conv. Coupe	2-4	2	1175	....	124	3.92
Conv. Sedan	5	4	1485	....	124	3.92
LINCOLN Zephyr						
Coupe	3	2	1090	....	122	4.44
Sedan	5	4	1190	....	122	4.44
Coupe-Sedan	5	2	1170	....	122	4.44
Twn. Limousine	5	4	1350	....	122	4.44
NASH Nash-Lafayette 400						
Coupe	3	2	595	....	117	4.11
Coupe	3-5	2	650	....	117	4.11
Victoria Sedan	6	2	655	....	117	4.11
Sedan	6	4	700	....	117	4.11
Cabriolet	5	2	740	....	117	4.11
Ambassador Six						
Coupe	3	2	755	....	121	4.11
Coupe	3-5	2	795	....	121	4.11
Victoria Sedan	6	2	795	....	121	4.11
Sedan	6	4	845	....	121	4.11
Cabriolet	5	2	880	....	121	4.11
Ambassador Eight						
Coupe	3	2	855	....	125	4.11
Coupe	3-5	2	895	....	125	4.11
Victoria Sedan	6	2	895	....	125	4.11
Sedan	6	4	945	....	125	4.11
Cabriolet	5	2	960	....	125	4.11
OLDSMOBILE Six						
Sedan	5	2	740	....	117	4.37
Tour. Sed., Trunk	5	2	765	....	117	4.37
Sedan	5	4	790	....	117	4.37
Tour. Sed., Trunk	5	4	815	....	117	4.37
Business Coupe	2	2	685	....	117	4.37
Conv. Coupe	2-4	2	835	....	117	4.37
Club Coupe	2-4	2	740	....	117	4.37
Eight						
Sedan	5	2	840	....	124	4.37
Tour. Sed., Trunk	5	2	865	....	124	4.37
Sedan	5	4	890	....	124	4.37
Tour. Sed., Trunk	5	4	915	....	124	4.37
Business Coupe	2	2	785	....	124	4.37
Conv. Coupe	2-4	2	935	....	124	4.37
Club Coupe	2-4	2	840	....	124	4.37
PACKARD Six Model 115-C						
Tour. Sedan	5	4	910	3310	115	4.36
Sedan	5	4	895	3265	115	4.36
Club Sedan	5	4	900	3275	115	4.36
Tour. Coupe	5	2	860	3235	115	4.36
Coupe	2-4	2	840	3215	115	4.36
Conv. Coupe	2-4	2	910	3285	115	4.36
Business Coupe	2	2	795	3140	115	4.36
Eight Model 120-C						
Tour. Sedan	5	4	1060	3520	120	4.09
Sedan	5	4	1045	3465	120	4.09
Club Sedan	5	4	1050	3455	120	4.09
Tour. Coupe	5	2	1010	3435	120	4.09
Sport Coupe	2-4	2	990	3415	120	4.09
Conv. Coupe	2-4	2	1060	3485	120	4.09
Conv. Sedan	5	4	1355	3630	120	4.09
Business Coupe	2	2	945	3340	120	4.09
Model 120-CD De Luxe						
Tour. Sedan	5	4	1270	3550	120	4.09
Club Sedan	5	4	1260	3485	120	4.09
Tour. Coupe	5	2	1220	3465	120	4.09
Tour. Sedan	7	4	1690	3835	138	4.09
Tour. Limousine	7	4	1840	3900	138	4.09
Super Eight Model 1500						
Tour. Sedan	5	4	2335	4530	127	4.69
Model 1501						
Formal Sedan	5	4	3235	4795	134	4.69
Tour. Sedan	5	4	2535	4670	134	4.69
Club Sedan	5	4	2530	4600	134	4.69
Coupe	5	2	2510	4595	134	4.69
Coupe	2-4	2	2420	4585	134	4.69
Coupe Roadster	2-4	2	2680	4580	134	4.69
Victoria	5	2	3150	4650	134	4.69
A. W. Cab. (LeB)	5-7	4	4850	4965	134	4.69
Model 1502						
Tour. Sedan, 7 p.	5-7	4	2705	4700	139	4.69
Tour. Lim., 7 p.	5-7	4	2840	4815	139	4.69
Conv. Sedan, 5 p.	5	4	3350	4945	139	4.69
A. W. Town Car (LeB)	7	4	4990	5360	139	4.69
Business Sedan	5-8	4	2580	....	139	4.69
Business Lim.	5-8	4	2715	....	139	4.69
Twelve Model 1506						
Tour. Sedan	5	4	3490	5335	132	4.41

BODY, MAKE AND MODEL	No. of Pass.	No. or Doors	Price	Ship. Weight	Wheelbase	R. A. Gear Ratio
PACKARD—Cont. Model 1507						
Formal Sedan	5	4	4260	5550	139	4.41
Tour. Sedan	5	4	3560	5525	139	4.41
Club Sedan	5	4	3660	5520	139	4.41
Coupe	5	2	3590	5415	139	4.41
Coupe	2-4	2	3420	5255	139	4.41
Coupe Roadster	2-4	2	3450	5255	139	4.41
Victoria	5	2	4490	5345	139	4.41
A.W. Cab. (LeB)	5-7	4	5700	5740	139	4.41
Model 1508						
Tour. Sedan	5-7	4	3885	5600	144	4.41
Touring Lim.	5-7	4	4085	5660	144	4.41
Conv. Sedan	5	4	4650	5680	144	4.41
A. W. Town Car (LeB)	5-7	4	5900	5790	144	4.41
PIERCE-ARROW Eight—1701						
Sedan	5	4	3195	5675	138	4.58
Club Sedan	5	4	3295	5600	138	4.58
Coupe	2-4	2	3195	5645	138	4.58
Conv. Roadster	2-4	2	3295	5590	138	4.58
Club Berline	5	4	3445	....	138	4.58
Formal Sedan	5	4	3445	....	138	4.58
Sedan	7	4	3500	5820	144	4.58
Enc. Dr. Lim.	7	4	3650	5860	144	4.58
Brunn Town Bro.	7	4	5295	5840	144	4.58
Conv. Sedan	5	4	....	4100	144	4.58
Twelve—1702						
Sedan	5	4	3695	5920	138	4.58
Club Sedan	5	4	3795	5850	138	4.58
Coupe	2-4	2	3695	5855	138	4.58
Conv. Roadster	2-4	2	3795	5800	138	4.58
Club Berline	5	4	3945	....	138	4.58
Formal Sedan	5	4	3945	....	138	4.58
Sedan	7	4	4000	6065	144	4.58
Enc. Dr. Lim.	7	4	4150	6105	144	4.58
Brunn Twn. Bro.	7	4	5795	6085	144	4.58
Conv. Sedan	5	4	4600	5921	144	4.58
1703						
Sedan	7	4	4795	6125	147	4.58
Enc. Dr. Lim.	7	4	4995	6145	147	4.58
PLYMOUTH Six—P3						
Coupe	2	2	510	2700	112	3.90
Sedan	5	2	550	2770	112	3.90
Sedan	5	4	595	2770	112	3.90
De Luxe—P4						
Coupe	2	2	575	2765	112	4.10
Coupe	2-4	2	625	....	112	4.10
Conv. Coupe	2-4	2	....	....	112	4.10
Sedan	5	2	640	2825	112	4.10
Sedan	5	4	670	2840	112	4.10
Tour. Sedan	5	2	650	2840	112	4.10
Tour. Sedan	5	4	680	2840	112	4.10
Sedan	7	4	....	....	132	4.10
PONTIAC De Luxe 6						
Business Coupe	2	2	650	....	117	4.37
Sedan	5	2	695	....	117	4.37
Sport Coupe	2-4	2	720	....	117	4.37
Tour. Sedan	5	2	720	....	117	4.37
Cabriolet	4	2	810	....	117	4.37
Sedan	5	4	745	....	117	4.37
Tour. Sedan	5	4	770	....	117	4.37
De Luxe 8						
Business Coupe	2	2	725	....	122	4.37
Sedan	5	2	760	....	122	4.37
Sport Coupe	4	2	780	....	122	4.37
Tour. Sedan	5	2	785	....	122	4.37
Cabriolet	4	2	850	....	122	4.37
Sedan	5	4	805	....	122	4.37
Tour. Sedan	5	4	830	....	122	4.37
STUDEBAKER Dictator						
Business Coupe	3	2	665	2965	116	4.55
Custom Coupe	3-5	2	715	3005	116	4.55
Custom Coupe	3-5	2	740	3045	116	4.55
Cruising Sedan	5	4	795	3140	116	4.55
Custom Sedan	5	4	775	3130	116	4.55
St. Reg. Cus. Sd	5	2	745	3100	116	4.55
St. Reg. Cru. Sd	5	2	765	3100	116	4.55
President						
Custom Coupe	3-5	2	965	3510	125	4.55
Custom Coupe	3-5	2	995	3540	125	4.55
Custom Sedan	5	4	1045	3620	125	4.55
Cruising Sedan	5	4	1065	3635	125	4.55
St. Reg. Cus. Sd	5	2	1015	3600	125	4.55
St. Reg. Cru. Sd	5	2	1035	3610	125	4.55
TERRAPLANE De Luxe 6-71						
Business Coupe	2	2	595	....	117	4.11
Coupe	3	2	605	....	117	4.11
Brougham	6	2	625	....	117	4.11
Tour. Brougham	6	2	645	....	117	4.11
Victoria	3-5	2	650	....	117	4.11
Sedan	6	4	675	....	117	4.11
Tour. Sedan	6	4	695	....	117	4.11
Super 6-72						
Coupe	3	2	680	....	117	4.11
Brougham	6	2	680	....	117	4.11
Tour. Brougham	6	2	700	....	117	4.11
Victoria	..	2	700	....	117	4.11
Sedan	6	4	725	....	117	4.11
Tour. Sedan	6	4	745	....	117	4.11
WILLYS—'37						
Sedan	5	4	450	2250	100	4.30
Coupe	2	2	395	2120	100	4.30
Del. Sedan	5	4	490	....	100	4.30
Del. Coupe	2	2	435	....	100	4.30

GENERAL AND ENGINE SPECIFICATIONS

Line Number	CAR MAKE AND MODEL	Wheelbase (Ins.)	Tread (Ins.) Front	Tread (Ins.) Rear	Overall Length (Ins.) with Bumpers	Shipping Weight (Lbs.) Cheapest 5-pass., 4-door Sedan	Tire Size	Gear Ratio—5-pass., 4-door Sedan	ENGINE: No. of Cylinders, Bore and Stroke	Valve Arrangement	Cylinder Arrangement	Cylinder Head Material	Piston Displacement (Cu. Ins.)	Taxable Hp.	Maximum Brake Hp. at Specified R.P.M.	Maximum Torque (Lbs. Ft.) at Specified R.P.M.	Comp. Ratio to 1: Standard	Comp. Ratio to 1: Optional	Comp. Pressure (Lbs.): Pressure	Comp. Pressure (Lbs.): At What R.P.M.	Weight per Cu. In., 5-pass., 4-door Sedan	Weight per Hp., 5-pass., 4-door Sedan	Hp. per Cu. In.	Engine Revolutions per Mile †	Displacement Factor ††	Line Number
1	American-Bantam		46	46	120	1200*	4.75/16	*	4-2.2x3				45.6	7.8	20–4000						*					1
2	Auburn 654	120	59	62		3279	6.00/16	4.44	6–3 1/16x4 3/4	L	II	Al	209.9	22.5	85–3500		6.20	No			15.6	38.6	.40	3325	36.4	2
3	Auburn 852	127	59	62		3580	6.50/16	4.08	8–3 1/16x4 3/4	L	II	Al	279.9	30.0	115–3600		6.50	No			12.8	33.1	.41	2958	40.4	3
4	Auburn SC-852	127	59	62		3915	7.00/16	4.08	8–3 1/16x4 3/4	L	II	Al	279.9	30.0	150–4000		6.50	7.00			14.0	26.1	.53	2827		4
5	Buick Special 37-40	122	58 1/16	59	199 11/32	3519	6.50/16	4.40	8–3 1/16x4 1/2	I	II	CI	248.0	30.63	100–3200	196–2000	5.70		103	SS	14.2	35.19	.403	3190	39.2	5
6	Buick Century 37-60	126	58 1/16	59 1/4	203 3/16		7.00/15	3.90	8–3 1/16x4 1/8	I	II	CI	320.2	37.81	130–3400	258–2000	5.75		106	SS			.407			6
7	Buick Roadmaster 37-80	131	59 1/2	60 1/2	207 7/16	4131	7.00/16	4.22	8–3 1/16x4 1/8	I	II	CI	320.2	37.81	130–3400	258–2000	5.75		106	SS	12.9	31.8	.407	2924	39.4	7
8	Buick Limited 37-90	138	59 7/16	62 1/2	214 1/16	4461	7.50/16	4.62	8–3 1/16x4 1/8	I	II	CI	320.2	37.81	130–3400	258–2000	5.75		106	SS	13.95	34.3	.407	3086	40.2	8
9	Cadillac V8-60	124	58	59	201 1/4		7.00/16	3.69	8–3 1/16x4 1/2	L	V	CI	346.0	39.20	135–3400		6.25	5.75					.390	2557		9
10	Cadillac V8-65	131	60 1/16	60 1/2	208 1/16		7.50/16	4.30	8–3 1/16–4 1/2	L	V	CI	346.0	39.20	135–3400		6.25	5.75					.390	2903		10
11	Cadillac V8-70	131	60 1/16	60 1/2	208 1/16		7.50/16	4.30	8–3 1/16x4 1/2	L	V	CI	346.0	39.20	135–3400		6.25	5.75					.390	2903		11
12	Cadillac V8-75	138	60 1/16	62 1/2	215 7/8		7.50/16	4.30	8–3 1/16x4 1/2	L	V	CI	346.0	39.20	135–3400		6.25	5.75					.390	2872		12
13	Cadillac V12-85	138	60 1/16	62 1/2	215 7/8		7.50/16	4.60	12–3 1/16x4	I	V		368.0	46.90	150–3600		6.00	5.65	145	1000			.407	3073		13
14	Cadillac V16-90	154	59 5/8	62	238		7.50/17	4.64	16–3x4	I	V		452.0	57.60	185–3800		6.00	5.65	154	1000			.409	3021		14
15	Chevrolet Master	112 1/4	56 5/8	57 9/16	187 1/4		6.00/16	3.73	6–3 1/16x3 3/4	I	II	CI	216.5	29.50	85–3200	170–(d)	6.25	No	112	65			.394	2794		15
16	Chevrolet Master De Luxe	112 1/4	57 11/16	57 9/16	187 1/4		6.00/16	4.22	6–3 1/16x3 3/4	I	II	CI	216.5	29.50	85–3200	170–(d)	6.25	No	112	65			.394	3161		16
17	Chrysler Royal C-16	116, 133	56 11/16	60	198 1/16	3049	6.00/16	4.10	6–3 5/8x4 1/4	L	II	Al	228.1	27.34	93–3600		6.50	7.00	155	1000	14.0	32.8	.407	3071	38.8	17
18	Chrysler Imperial C-14	121	57 1/8	59 7/8	204 1/4		6.50/16	4.10	8–3 1/4x4 1/8	L	II	Al	273.8	33.80	110–3600		6.70	No					.402	2973		18
19	Chrysler Custom Imperial C-15	140	57 1/8	63	223 1/4		7.50/16	4.55	8–3 1/4x4 1/8	L	II	Al	323.5	33.80	130–3400		6.50	7.45	150	1000			.402	3039		19
20	Chrysler Airflow C-17	128	57	57 1/4	213 1/8	4203	7.50/16	4.30	8–3 1/4x4 1/8	L	II	Al	323.5	33.80	130–3400		6.50	7.45	150	1000	13.0	32.6	.402	2903		20
21	Cord Front Drive 812	125	56	61	195 1/2	3715	6.50/16	3.88	8–3 1/16x3 3/4	L	V	Al	288.6	39.20	115–3600	220–1700	6.32		110	130			.399	2809	40.3	21
22	De Soto S-3	116	56 11/16	60	198 11/16	3039	6.00/16	4.10	6–3 5/8x4 1/4	L	II	CI	228.1	27.34	93–3600		6.50	7.00	155	1000	13.63	32.7	.407	3071	39.0	22
23	Dodge D-5	115	56	60 1/8	196 1/8	2912	6.00/16	4.10	6–3 1/16x4 1/8	L	II	CI	217.8	25.35	87–3600		6.50	No	140	1000	13.7	33.4	.400	3071	38.7	23
24	Duesenberg J	143, 154	57 1/16	58			7.00/18	3.78°	8–3 3/4x4 3/4	I	II	CI	420.0	45.00	265–4200		5.20	No					.631	2457		24
25	Ford V8-60	112	55.47	58.25			5.50/16	4.44	8–2.60x3.20	L	V		136.0	21.63	60–3500	94–2500	6.75						.432			25
26	Ford V8-85	112	55.47	58.25			6.00/16	3.78	8–3.062x3.75	L	V		221.0	30.00	85–3500	149–2000	6.12		100	SS			.385			26
27	Graham Crusader 85	111	56 3/4	56 3/4	185 1/2	2695	(b)	4.55	6–3x4	L	II	Al	169.6	21.60	70–3500	128–1500	6.80	No			15.9	38.5	.413	3408	35.7	27
28	Graham Cavalier 95	116	60 5/8	61 1/4	198	2960	6.00/16	4.45	6–3 1/4x4	L	II	Al	199.1	25.35	85–3300	137–1600	6.70	No			14.9	34.8	.427	3333	37.9	28
29	Graham Supercharger 116	116	60 5/8	61 1/4	198	3125	6.00/16	4.27	6–3 1/4x4	L	II	Al	199.1	25.35	106–4000	165–2500	6.70	No			15.7	29.5	.532	3194		29
30	Graham Supercharger 120	120	60 5/8	61 1/4	202	3200	6.25/16	4.27	6–3 1/4x4 3/8	L	II	Al	217.8	25.35	116–4000	180–3000	6.70	No			14.7	27.6	.533	3164		30
31	Hudson 73	122	56	57 1/2	197 7/8		6.00/16	4.11	6–3x5	L	II	CI	212.0	21.60	101–4000	170	6.25	7.00	80	125			.477	3078		31
32	Hudson 74-5-6-7	122, 129	56	57 1/2	(c)		6.25/16	4.10	8–3x4 1/2	L	II	CI	254.0	28.8	122–4200	200	6.25	7.00					.480	3038		32
33	La Salle 37-50	124	58	59	201 1/4		7.00/16	3.92	8–3 5/8x4 1/2	L	V	CI	322.0	36.45	125–3400		6.25	5.75	155	1000			.388	2717		33
34	Lincoln Zephyr	122	55 1/2	58 1/4	205 1/2	3400	7.00/16	4.44	12–2.75x3.75	L	V	Al	267.3	36.30	110–3900		6.70				12.7	30.9	.412	3077	42.6	34
35	Lincoln V-12	136, 145							12–		V	Al														35
36	Nash Lafayette 400-3710	117	58	60 1/4	196 7/16	3300	6.00/16	4.11	6–3 5/8x4 3/8	L	II	CI	234.8	27.34	90–3400	171–1200	5.61	5.88	100	125	14.0	36.7	.384	3078	37.4	36
37	Nash Ambassador 6-3720	121	58	60 1/4	200 7/16	3400	6.25/16	4.11	6–3 5/8x4 3/8	I	II	CI	234.8	27.34	93–3400	174–1600	5.67		100	125	14.5	36.6	.396	3046	36.2	37
38	Nash Ambassador 8-3780	125	58	60	200 7/16	3720	7.00/16	4.11	8–3 1/16x4 1/4	I	II	CI	260.8	31.25	105–3400	196–1800	5.64		90	125	14.2	34.5	.402	2848	35.5	38
39	Oldsmobile F-37	117	58	59	192 11/16		6.50/16	4.37	6–3 7/16x4 1/8	L	II	CI	229.7	28.40	95–3400	180–1600	6.10	No	146	1000			.413	3168		39
40	Oldsmobile L-37	124	58	59	199 5/16		7.00/16	4.37	8–3 1/4x3 7/8	L	II	CI	257.1	33.80	110–3600	200–1800	6.20	No	152	1000			.428	3028		40
41	Packard Six	115	59	60	194 7/8	3265	6.50/16	4.36	6–3 7/16x4 1/4	L	II	CI	237.0	28.36	100–3600		6.30	6.75	110	125	13.8	32.6	.4219	3170	39.7	41
42	Packard 120-C	120	59	60	195 27/32	3465	7.00/16	4.09	8–3 1/4x4 1/4	L	II	Al	282.04	33.8	120–3800		6.50	7.0	110	125	12.3	28.9	.425	2851	40.7	42
43	Packard Super Eight	127, 34, 39	59 1/4	61	222 21/32	4530	7.50/16	4.69	8–3 1/16x5	L	II	Al	320.0	32.5	135–3200		6.50	No	110	125	14.2	33.6	.4218	3133	40.1	43
44	Packard Twelve	132, 39, 44	60 1/4	61	227 1/32	5335	8.25/16	4.41	12–3 7/16x4 1/4	M	V	Al	473.0	56.7	175–3200		6.40	(a)	110	125	11.3	30.5	.370	2837		44
45	Pierce-Arrow 1701	139, 144	59 1/2	61 1/2	(e)	5675	7.00/17	4.58	8–3 1/2x5	L	II	Al	385.0	39.20	150–3400		6.40	No	77		14.7	37.8	.389	3087	37.6	45
46	Pierce-Arrow 1702	138, 144	59 1/2	61 1/2	(f)	5920	7.50/17	4.58	12–3 1/2x4	L	V	Al	462.0	58.80	185–3400		6.40	No	83		12.8	32.0	.401	2982	42.0	46
47	Pierce-Arrow 1703	147	59 1/2	61 1/2	223 3/4	6125(g)	7.50/17	4.58	12–3 1/2x4	L	V	Al	462.0	58.80	185–3400		6.40	No	83		13.2	33.1	.401	2982	40.7	47
48	Plymouth P-3	112	55 13/32	59 11/32	193 3/8	2770	5.50/16	3.90	6–3 1/16x4 3/8	L	II	CI	201.3	23.44	82–3600		6.70		145	1000	13.8	33.8	.408			48
49	Plymouth De Luxe P-4	112	55 13/32	59 11/32	193 3/8	2840	6.00/16	4.10	6–3 1/16x4 3/8	L	II	CI	201.3	23.44	82–3600		6.70		145	1000	14.1	34.6	.408	3071	36.5	49
50	Pontiac De Luxe Six 37-26 CA	117	58 5/8	59	193 1/16		6.00/16	4.37	6–3 7/16x4	L	II	CI	222.7	28.3	85–3250	70–1600	6.20	No	141.5	1000			.382	3273		50
51	Pontiac De Luxe Eight 37-28 CA	122	58 5/8	59	198 1/16		6.50/16	4.37	8–3 1/4x3 3/4	L	II	CI	248.9	33.8	99–2800	76–1600	6.20	No	141.5	1000			.397	3168		51
52	Studebaker Dict. & D. Pl. 6	116	57 5/8	60 3/4	192 7/16	3130	6.00/16	4.55	6–3 1/4x4 3/8	L	II	CI	217.8	25.4	90–3400		6.00	No	105	150	14.4	34.8	.413	3408	40.2	52
53	Studebaker President	125	60 5/8	61 1/16	201 7/16	3620	6.50/16	4.55	8–3 7/16x4 1/4	L	II	Al	250.4	30.0	115–3600		6.50	No			14.5	31.5	.455	3299	39.9	53
54	Terraplane 71	117	56	57 1/2	193 1/16		6.00/16	4.11	6–3x5	L	II	CI	212.0	21.6	96–3900	170	6.25	7.0	80	125			.452	3078		54
55	Terraplane 72	117	56	57 1/2	193 1/16		6.00/16	4.11	6–3x5	L	II	CI	212.0	21.6	101–4000	170	6.25	7.0	80	125			.477	3078		55
56	Willys 37	100	55	56	175 1/4		5.50/16	4.30	4–3 1/2x4 3/8	L	II	CI	134.2	15.63	48–3200	100–1600	5.70	No	87	216			.358			56

†—Computed on basis all tires are of same make, specified plies and standard rear axle ratio, except when furnished by manufacturer. °—Others Also *—Coupe

††—Computed on basis of displacement, gear ratio, effective tire diameter and weight with normal load.

(a)—6.0 to 1 and 7.0 to 1
(b)—5.25/17—2 Door Sedan; 6.00/16—4 Door Sedan

ABBREVIATIONS:

Al—Aluminum
(c)—Mod. 74-5, 197 7/8; Mod. 76-7, 202 1/8
CI—Cast Iron
CNS—Chrome Nickel Steel
CS—Cast Steel
(d)—900 to 2000
(e)—138 WB–216 in.; 144WB–221 in.
(f)—138WB–216 in.; 144WB–220 3/4 in.
(g)—7 Pass. Sedan
I—In Head
II—In Line
L—ELl Head
SS—Starter Speed

PISTONS, RINGS, CONNECTING RODS

Line Number	CAR MAKE AND MODEL	Number of Cylinders, Bore and Stroke	PISTON									PISTON RINGS								WRIST PIN				CONNECTING RODS			
								Clearance (Inches) Average			Ring Groove Depth (Ins.)		OIL				Compression											
			Make	Material	Features	Weight (Ozs.) without rings, pin or bushing	Length (Inches)	Top	Bottom	Number of Grooves	Oil	Compression	Number Used	Width (Ins.)	Average Gap (Ins.)	Maximum Wall Thickness (Ins.)	Number Used	Width (Ins.)	Average Gap (Ins.)	Maximum Wall Thickness (Ins.)	Length (Ins.)	Diameter (Ins.)	Locked In	Clearance Average (Ins.)	Length (Ins.)	Material	Weight (Ozs.)	Line Number
1	American Bantam	4-2.2x3		CS									1				3						F			CNS		1
2	Auburn 654	6-3 1/16 x4 5/8	Bohn	Al		16.00	3 3/4	.0097	.0015		.159	.179	2	(c)	.013		2	1/8	.013		2 1/2	7/8	R	SF	9 1/2	1035	37.40	2
3	Auburn 852	8-3 1/16 x4 5/8	Bohn	Al		16.00	3 3/4	.0097	.0015		.159	.179	2	(c)	.013		2	1/8	.013		2 1/2	7/8	R	SF	9 1/2	1035	37.40	3
4	Auburn SC-852	8-3 1/16 x4 5/8	RaDa	Al		14.40	3 3/4	.0012	.0132			.179	1	1/16	.015		2	1/8	.013		2 1/2	7/8	R	SF	9 1/2	1035	37.40	4
5	Buick 37-40	8-3 1/32 x4 1/8	Own	Lx-Al	Trs,C,An	13.75	3.81	.0220	.0021	4	.167	.150	2	1/16	.0125	.135	2	3/32	.0125	.135	2 1/16	7/8	R	.0003	7 5/8	1045	29.92	5
6	Buick 37-60	8-3 1/16 x4 1/8	Own	Lx-Al	Trs,C,An	18.25	4.16	.0250	.0023	4	.178	.165	2	1/16	.0125	.145	2	3/32	.0125	.145	3 1/16	7/8	R	.0003	8 1/4	1045	38.43	6
7	Buick 37-80	8-3 1/16 x4 1/8	Own	Lx-Al	Trs,C,An	18.25	4.16	.0250	.0023	4	.178	.165	2	1/16	.0125	.145	2	3/32	.0125	.145	3 1/16	7/8	R	.0003	8 1/4	1045	38.43	7
8	Buick 37-90	8-3 1/16 x4 1/8	Own	Lx-Al	Trs,C,An	18.25	4.16	.0250	.0023	4	.178	.165	2	1/16	.0125	.145	2	3/32	.0125	.145	3 1/16	7/8	R	.0003	8 1/4	1045	38.43	8
9	Cadillac V8-60	8-3 1/32 x4 1/2	Bohn	Lx-Al	Ts,An	18.30	4 1/2	.025	.0021	4	.153	.151	2	1/32	.011	.150	2	1/8	.0095	.150	3 1/16	7/8	F	PF	8 3/4	1340	60.56	9
10	Cadillac V8-65	8-3 1/32 x4 1/2	Bohn	Lx-Al	Ts,An	18.30	4 1/2	.025	.0021	4	.153	.151	2	1/32	.011	.150	2	1/8	.0095	.150	3 1/16	7/8	F	PF	8 3/4	1340	60.56	10
11	Cadillac V8-70	8-3 1/32 x4 1/2	Bohn	Lx-Al	Ts,An	18.30	4 1/2	.025	.0021	4	.153	.151	2	1/32	.011	.150	2	1/8	.0095	.150	3 1/16	7/8	F	PF	8 3/4	1340	60.56	11
12	Cadillac V8-75	8-3 1/32 x4 1/2	Bohn	Lx-Al	Ts,An	18.30	4 1/2	.025	.0021	4	.153	.151	2	1/32	.011	.150	2	1/8	.0095	.150	3 1/16	7/8	F	PF	8 3/4	1340	60.56	12
13	Cadillac V12-85	12-3 1/32 x4	Lyn	Lx-Al	Ts,An	11.71	3 1/16	.019	.002	4	.137	.142	1	.154	.011	.135	3	.093	.0095	.135	2.812	.874	P	PF	9 1/4	1340	31.85	13
14	Cadillac V16-90	16-3 x4	Lyn	Lx-Al	Ts,An	10.96	3 1/16	.018	.018	4	.132	.134	1	.154	.011	.130	3	.093	.0095	.130	2.812	.874	P	PF	9 1/4	1340	31.85	14
15	Chevrolet Master	6-3 1/32 x3 3/4	Own	CI	T,D,Sls	22.70	3 11/16	.0095	.0022	3	.178	.156	1	1/16	.010	.155	2	1/32	.010	.155	3 3/32	.865	R	SF	6 11/16	FS	28.00	15
16	Chevrolet Master De Luxe	6-3 1/32 x3 3/4	Own	CI	T,D,Sls	22.70	3 11/16	.0095	.0022	3	.178	.156	1	1/16	.010	.155	2	1/32	.010	.155	3 3/32	.865	R	SF	6 11/16	FS	28.00	16
17	Chrysler Royal C-16	6-3 5/16 x4 1/4		Al	Us,C,An		3 7/8	.022	.002	4	.177	.157	2	1/32	.011	.145	2	1/32	.011	.145	2 7/8	11/16	F		8	MS		17
18	Chrysler Imperial C-14	8-3 1/32 x4 1/8		Al	Us,C,An		3 7/8	.022	.002	4	.177	.157	2	1/32	.011	.145	2	1/32	.011	.145	2 3/4	11/16	F		9 1/16	MS		18
19	Chrysler Custom Imperial C-15	8-3 1/32 x4 1/8		Al	Us,C,An		3 7/8	.022	.002	4	.177	.157	2	1/32	.011	.145	2	1/32	.011	.145	2 3/4	11/16	F		9 1/16	MS		19
20	Chrysler Airflow C-17	8-3 1/32 x4 1/8		Al	Ts,C,An		3 7/8	.022	.002	4	.177	.157	2	1/32	.011	.145	2	1/32	.011	.145	2 3/4	11/16	F		9	MS		20
21	Cord Front Drive 812	8-3 1/32 x3 3/4	RaDa	Al	Ts,St	20.0	3 11/16	.026	.002	4	.163	.183	2	.155	.011	.150	2	.093	.011	.150	2.591	.675	F	.0002	7 5/8	1035	31.7	21
22	De Soto S-3	6-3 5/16 x4 1/4		Al	Us,C,An		3 7/8	.022	.002	4	.177	.157	2	1/32	.011	.145	2	1/32	.011	.145	2 7/16	11/16	F		8	MS		22
23	Dodge D-5	6-3 1/4 x4 5/8		Al	Se,St		3 11/16	.022	.0017	4	.177	.157	2	1/32	.011	.145	2	1/32	.011	.145	2 3/4	11/16	F		7 11/16	MS		23
24	Duesenberg 8	8-3 3/4 x4 3/4	RaDa	Ala	Ss	20.0	4 5/8	.022	.0035		.166	.161	1	1/16		.145	3	1/8		.145	3 1/4	1 1/16	F		9 1/16	Dur	18.0	24
25	Ford V8-60	8-2.60x3.20	Own	CSA		8.11																.687			6 1/4		9.52	25
26	Ford V8-85	8-3.062x3.75	Own	CSA		10.62							1	.154			2	.092				.750	F		7	FS	16.54	26
27	Graham Crusader 85	6-3x4	Bohn	Al	St,T	14.0	3 11/16		.0020	4			2	(a)			2	1/32			2 5/8	11/16	R	.0005	7	FS		27
28	Graham Cavalier 95	6-3 1/4 x4	Bohn	Al	A,St,C,T	17.0	3 5/8		.0025	4			2	(a)	.012		2	1/16	.012		2 11/16	11/16	R	.0005	7	FS		28
29	Graham Supercharger 116	6-3 1/4 x4	Bohn	Al	A,St,C,T	17.0	3 5/8		.0025	4			2	(a)	.012		2	1/32	.012		2 11/16	11/16	R	.0005	7	FS		29
30	Graham Supercharger 120	6-3 1/4 x4 5/8	Bohn	Al	A,St,C,T	17.0	3 5/8		.0025	4			2	(a)	.012		2	1/16	.012		2 11/16	11/16	R	.0005	7	FS		30
31	Hudson 73	6-3x5	Own	Lx-Al	Ts,C	10.50	3.18	.016	.0007	4	.187	.093	2	.187	.010	.128	2	.093	.010	.123	2.437	.750	F	.0003	8.187	FS	24.0	31
32	Hudson 74-5-6-7	8-3x4 1/4	Own	Lx-Al	Ts,C	10.88	3.18	.016	.0007	4	.187	.093	2	.187	.010	.128	2	.093	.010	.123	2.437	.750	F	.0003	8.187	FS	29.4	32
33	La Salle 37-50	8-3 5/16 x4 1/4	Lyn	Lx-Al	Ts,An	16.88	4 1/16	.019	.0013	4	.154	.152	2	1/16	.011	.145	2	1/16	.0095	.145	2 1/16	7/8	F	PF	8 3/4	1340	60.56	33
34	Lincoln Zephyr V12	12-2 3/4 x3 3/4		CSA		11.50	2.97				.145	.145	1	.155	.010	.125	2	1/32	.010	.125	2.48	3/4	F	.0005	7.40	SFS	20.6	34
35	Lincoln																											35
36	Nash Lafayette 400-3710	6-3 5/16 x4 1/4	Bohn	Al	Se,St			.022	.0020	4			2				2					7/8	F	.0001	8 3/8	FS			36
37	Nash Ambassador 6-3720	6-3 5/16 x4 5/8	Bohn	Al	Se,St			.022	.0020	4			2				2					7/8	F	.0001	8 3/4	FS			37
38	Nash Ambassador 8-3780	8-3 1/16 x4 1/4	Bohn	Al	Se,St			.020	.0020	4			2				2					7/8	F	.0001	8 3/4	FS			38
39	Oldsmobile F-37	6-3 1/16 x4 1/8	Own	Al	Ss,O	17.50	4 1/32	.026	.0015	4	11/32	11/32	2	1/16	.011	.150	2	1/8	.0105	.153	3 1/16	11/16	P	.0004	7 11/16	1335-A	28.25	39
40	Oldsmobile L-37	8-3 1/4 x3 7/8	Own	Al	Ss,O	16.25	3 11/16	.026	.0015	4	11/32	11/32	2	1/16	.011	.150	2	1/8	.0115	.150	2 11/16	11/16	P	.0004	7 11/16	1335-A	28.00	40
41	Packard Six	6-3 1/16 x4 1/4	Bohn	Al	A,St,C,T	19.0	3 7/8		.0015	3			1	1/16	.011		2	1/8	.0095		2 11/16	7/8	F	PP	7 11/16	FS	32 1/2	41
42	Packard 120-C	8-3 1/4 x4 1/4	Bohn	Al	A,St	17.6	3 7/8		.0015	3			1	1/16	.011		2	1/8	.0095		2 11/16	7/8	F	PP	7 11/16	FS	32 1/2	42
43	Packard Super Eight	8-3 1/16 x5	Bohn	Al	A,St	18.7	4 1/4		.0015	4			2	1/32	.011		2	1/8	.0095		2 11/16	7/8	F	PP	10 1/8	FS	41 1/2	43
44	Packard Twelve	12-3 1/16 x4 1/4	Bohn	Al	A,St	21.7	4.318		.0015	4			1	1/16	.011		3	1/32	.0095		2 11/16	7/8	F	PP	9	FS	40 5/8	44
45	Pierce-Arrow 1701	8-3 1/2 x5	Bohn	Al	St	22.7	4 1/4	.024	.002	4	.189	.169	1	.186	.015	.145	3	.123	.015	.145	3.03	.875	F		8.99	4140	34.62	45
46	Pierce-Arrow 1702	12-3 1/2 x4	Bohn	Al	St,C	22.7	4 1/4	.022	.0010	4	.176	.156	1	.186	.015	.145	3	.123	.015	.145	3.03	.875	F	.0005	9.63	4140	35.62	46
47	Pierce-Arrow 1703	12-3 1/2 x4	Bohn	Al	St,C	22.7	4 1/4	.022	.0010	4	.176	.156	1	.186	.015	.145	3	.123	.015	.145	3.03	.875	F	.0005	9.63	4140	35.62	47
48	Plymouth P-3	6-3 1/16 x4 1/8		Al	Us,C,An		3 11/16	.022	.0007	4	.171	.151	2	1/32	.011	.140	2	1/16	.011	.140	2 5/8	11/16	F		7 11/16	FS			48
49	Plymouth P-4	6-3 1/16 x4 1/8		Al	Us,C-An		3 11/16	.022	.0007	4	.171	.151	2	1/32	.011	.140	2	1/16	.011	.140	2 5/8	11/16	F		7 11/16	FS			49
50	Pontiac De Luxe Six 37-26 CA	6-3 7/32 x4	Own	CNI	T	26.68	3 11/16	.023	.002	3	3/16	3/16	1	1/16	.012	.150	2	1/16	.012	.150	3 1/16	11/16	R	.0004	7 1/16	FS	32.0	50
51	Pontiac De Luxe Eight 37-28 CA	8-3 1/4 x4	Own	CNI	T	24.25	3.58	.023	.002	3	.1785	.1585	1	.186	.012	.150	2	.124	.012	.150	2 7/8	11/16	R	.0004	7 1/16	FS	29 7/16	51
52	Studebaker Dict. & Dict. Pl. 6	6-3 1/4 x4 5/8	Lyn	Al	Ts,C	15.2	3.75	.017	.0015	3	.187	.1495	1	1/16	.0155	.135	2	1/16	.0155	.145	2 7/8	7/8	R	.0002	8 1/16	SFS	33.2	52
53	Studebaker President	8-3 1/4 x4 1/4	Lyn	Al	Ts,C	18.8	3.75	.017	.0015	3	.1755	.146	1	1/16	.017	.125	2	1/32	.0155	.135	2 5/8	7/8	R	.0002	8	SFS	32.0	53
54	Terraplane 71	6-3x5	Own	Lx-Al	Ts,C	10.5	3.18	.016	.0007	4	.187	.093	2	.187	.010	.128	2	.093	.010	.123	2.437	.750	F	.0003	8.187	FS	24.0	54
55	Terraplane 72	6-3x5	Own	Lx-Al	Ts,C	10.5	3.18	.016	.0007	4	.187	.093	2	.187	.010	.128	2	.093	.010	.123	2.437	.750	F	.0003	8.187	FS	24.0	55
56	Willys 37	4-3 1/16 x4 5/8	Own	CI	LW	22.0	3 3/4	.015	.0027	4			1	1/16	.011	.140	3	1/32	.0095	.140	2.682	.937	F	(b)	9 1/16	1035	34.0	56

(a)—Upper 1/32 Lower 1/32
Al—Aluminum
Ala—Aluminum—Anode Processed
Alcoa—Aluminum Co. of Amer.
An—Anodized
A,St—Autothermic, Strut Type

(b)—Piston .0003; Rod Bushing .0005
Bohn—Nelson Bohnalite
(c)—One 1/16, One 1/32
C—Cam Ground
CI—Cast Iron
CNI—Chrome Nickel Iron

CSA—Cast Steel Alloy
D—Dome Head
Dur—Dural
F—Floating
FS—Forged Steel

ABBREVIATIONS:
LW—Light Weight Type
Lx—LoEx Aluminum
Lyn—Lynite
MS—Manganese Steel
O—Oxidized Finish

P—Piston
PF—Press Fit
PP—Palm Push Fit
R—Rod
RaDa—Ray Day
Ss—Split Skirt

Sls—Slipper Type Skirt
SF—Selective Fit
SFS—Special Forged Steel
T—Tin Plated
Ts—Tee Slot
Trs—Tri Slot Us—U-Slot

CONNECTING ROD AND CRANKSHAFT BEARINGS

Line Number	CAR MAKE AND MODEL	CONNECTING ROD BEARINGS								CRANKSHAFT BEARINGS								DIAMETER AND LENGTH (Inches)									Total Area (Sq. Ins.)	Line Number
		Diameter and Length (Ins.)	Material	Make	Average Clearance (Ins.)	Average End Play (Ins.)	Type of Shim.	Type of Bearing	Rods and Pistons Removed from	Vibration Damper?	Crankshaft Counterweights	End Thrust taken by	Amount of End Play (Ins.)	Main Bearing Material	Average Bearing Clearance (Ins.)	Type of Bearing	Type of Shim.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9		
1	American Bantam	1⅛x1¼									Yes							1¾x1⅜	1¾x1½								15.90	1
2	Auburn 654	2⅛x1¼	Bab		.0025*	.009M	No			Yes	Yes	3	.010	BBb	.0016*	SI	No	2⅝x1⅝	2⅝x1⅝	2⅝x1⅝	2⅝x1⅞						52.69	2
3	Auburn 852	2⅛x1¼	Bab		.0025*	.009M	No			Yes	No	3	.010	BBb	.0016*	SI	No	2⅝x1⅝	2⅝x1⅝	2⅝x1⅝	2⅝x1⅝	2⅝x1⅞					64.81	3
4	Auburn SC-852	2⅛x1¼	Bab		.0025*	.009M	No			Yes	Yes	3	.010	BBb	.0016*	SI	No	2⅝x1⅝	2⅝x1⅝	2⅝x1⅝	2⅝x1⅝	2⅝x1⅞					64.81	4
5	Buick 37-40	2x1⅞	Bab	Own	.0013	.0075	So	Sp	A	Yes	8	C	.0055	BSb	.0015	Se	So	2⅛x1⅜	2⅝x1⅜	2⅛x1⅝	2⅛x1⅜	2⅛x2⅛					16.66	5
6	Buick 37-60	2¼x1⅛	Bab	Own	.0013	.0075	So	Sp	A	Yes	8	C	.0055	BSb	.0015	Se	So	2⅛x1⅜	2⅝x1⅜	2⅛x1⅜	2⅝x1⅜	2⅛x2⅛					19.38	6
7	Buick 37-80	2¼x1⅛	Bab	Own	.0013	.0075	So	Sp	A	Yes	8	C	.0055	BSb	.0015	Se	So	2⅛x1⅜	2⅝x1⅜	2⅛x1⅜	2⅝x1⅜	2⅛x2⅛					19.38	7
8	Buick 37-90	2¼x1⅛	Bab	Own	.0013	.0075	So	Sp	A	Yes	8	C	.0055	BSb	.0015	Se	So	2⅛x1⅜	2⅝x1⅜	2⅛x1⅜	2⅝x1⅜	2⅛x2⅛					19.38	8
9	Cadillac V8-60	2.46x2⅛	BSb	Bohn	.0015	.0045	No	Se	A	Yes	6	C	.0030	BBb	.0015	Se	No	2⅜x1⅛	2⅜x1⅛	2⅜x1⅛							32.88	9
10	Cadillac V8-65	2.46x2⅛	BSb	Bohn	.0015	.0045	No	Se	A	Yes	6	C	.0030	BBb	.0015	Se	No	2⅜x1⅛	2⅜x1⅛	2⅜x1⅛							32.88	10
11	Cadillac V8-70	2.46x2⅛	BSb	Bohn	.0015	.0045	No	Se	A	Yes	6	C	.0030	BBb	.0015	Se	No	2⅜x1⅛	2⅜x1⅛	2⅜x1⅛							32.88	11
12	Cadillac V8-75	2.46x2⅛	BSb	Bohn	.0015	.0045	No	Se	A	Yes	6	C	.0030	BBb	.0015	Se	No	2⅜x1⅛	2⅜x1⅛	2⅜x1⅛							32.88	12
13	Cadillac V12-85	2.50x2¼	Bab	Own	.0015	.0055	No	Sp	B	Amp	7	3	.0030	BSb	.0010	Se	No	2⅝x2⅛	2⅝x1½	2⅝x1½	2⅝x3⅛						74.21	13
14	Cadillac V16-90	2.50x2¼	Bab	Own	.0015	.0055	No	Sp	B	Amp	4	C	.0030	BSb	.0010	Se	No	2⅝x2⅛	2⅝x1½	2⅝x1½	2⅝x1½	2⅝x3.69					82.90	14
15	Chevrolet Master	2⅛x1⅛	Bab	Own	.0012	.010	So	Sp	A	Yes	7	3	.0050	BSb	.0030	SI	So	2⅛x1⅛	2⅛x1⅛	2⅛x1⅛	2⅛x1⅝						42.12	15
16	Chevrolet Master De Luxe	2⅛x1⅛	Bab	Own	.0012	.010	So	Sp	A	Yes	7	3	.0050	BSb	.0030	SI	So	2⅛x1⅛	2⅛x1⅛	2⅛x1⅛	2⅛x1⅝						42.12	16
17	Chrysler Royal C-16	2⅛x1¼	BSb		.0015	.0085	No	Se		Yes	Yes	R	.0050	BSb	.0015	SI	No	2⅛x1⅛	2⅛x1⅛	2⅛x1⅛	2⅛x1⅞						45.7	17
18	Chrysler Imperial C-14	2⅛x1⅛	BSb		.0020	.0085	No	Se		Yes	Yes	R	.0050	BSb	.0015	SI	No	2⅛x1⅜	2⅛x1⅜	2⅛x1⅜	2⅛x1⅜	2⅛x2⅛					62.1	18
19	Chrysler Cus. Imp. C-15	2⅛x1⅛	BSb		.0020	.0085	No	Se		Yes	Yes	R	.0050	BSb	.0015	SI	No	2⅛x1⅜	2⅛x1⅜	2⅛x1⅜	2⅛x1⅜	2⅛x2⅛					62.1	19
20	Chrysler Airflow C-17	2⅛x1⅛	BSb		.0020	.0085	No	Se		Yes	Yes	R	.0050	BSb	.0015	SI	No	2⅛x1⅜	2⅛x1⅜	2⅛x1⅜	2⅛x1⅜	2⅛x2⅛					62.1	20
21	Cord Front Drive 812	2x2⅝	Bab		.0022	.0090	No	Sp	A	No	4	C	.0070	BBb	.0027	SI	No	2½x2.416	2½x2.128	2½x1.785							38.86	21
22	De Soto S-3	2⅛x1¼	BSb		.0015	.0085	No	Se		Yes	Yes	R	.0050	BSb	.0015	SI	No	2⅛x1⅛	2⅛x1⅛	2⅛x1⅛	2⅛x1⅞						45.7	22
23	Dodge D-5	2⅛x1	BSb		.0015	.0085	No	Se		No	Yes	R	.0050	BSb	.0015	SI	No	2⅛x1⅜	2⅛x1⅜	2⅛x1⅜	2⅛x1⅞						40.6	23
24	Duesenberg 8	2⅛x1¾	Bab	Own	.0020		No	Sp		No	Yes		.0030	BBb	.0015			2¾x3⅛	2¾x1⅞	2¾x1⅞	2¾x1⅞	2¾x2⅛					106.3	24
25	Ford V8-60																	2.00x										25
26	Ford V8-85																	2.40x										26
27	Graham Crusader 85	1⅛x1⅛	CS-Sb		.0018		No	Se	A	No	5	F	.0050	CS-Sb	.002	SI	No	2¼x1⅜	2¼x1⅛	2¼x1⅛	2¼x1⅛						37.66	27
28	Graham Cavalier 95	2⅛x1⅛	CS-Sb		.002		No	Se	A	Lan	7	F	.0050	CS-Sb	.002	SI	No	2¼x1⅜	2¼x1⅜	2¼x1⅜	2¼x1⅜						37.66	28
29	Graham Supercharger 116	2⅛x1⅛	CS-Sb		.002	.005	No	Se	A	Lan	7	F	.0050	CS-Sb	.002	SI	No	2¼x1⅜	2¼x1⅜	2¼x1⅜	2¼x1⅜						37.66	29
30	Graham Supercharger 120	2⅛x1⅛	CS-Sb		.002	.005	No	Se	A	Lan	7	F	.0050	CS-Sb	.002	SI	No	2¼x1⅜	2¼x1⅜	2¼x1⅜	2¼x1⅜						37.66	30
31	Hudson 73	1.937x1.375	B-Sp	Own	.001	.008	Lam	Sp	A	Yes	8	C	.0090	BBb	.001	In	Lam	2.343x1.625	2.375x1.750	2.406x2.375							42.96	31
32	Hudson 74-5-6-7	1.937x1.375	B-Sp	Own	.001	.008	Lam	Sp	A	Yes	8	C	.0090	BBb	.001	In	Lam	2.381x1.625	2.312x1.375	2.343x1.875	2.375x1.375	2.406x2.000					61.62	32
33	La Salle 37-50	2.460x2⅛	BSb	Bohn	.0015	.0045	No	Se	A	No	6	C	.0030	BBb	.0015	SI	No	2½x1⅛	2½x1⅛	2½x1¾							32.88	33
34	Lincoln Zephyr V-12	2.12x.787	Cla	Own	.0022			Se			9	R	.0040	Cla	.0020		No	2.40x1.639	2.40x1.375	2.40x1.375	2.40x2.254						52.35	34
35	Lincoln																											35
36	Nash Lafayette 400-3710	2x1.426	BSb		.0020	.010	Yes	Se	A	Yes	4	C	.0040	BSb	.0020	SI	No	2¼x1¼	2¼x1⅜	2¼x1⅜	2¼x1⅞	2¼x1⅜	2¼x1⅜	2¼x1⅝			66.30	36
37	Nash Ambassador 6-3720	2x1⅜	BSb		.0020	.010	Yes	Se	A	Yes	4	C	.0040	BSb	.0020	SI	No	2¼x1¼	2¼x1⅜	2¼x1⅜	2¼x1⅞	2¼x1⅜	2¼x1⅜	2¼x1⅝			66.30	37
38	Nash Ambassador 8-3780	2x1⅜	BSb		.0020	.010	Yes	Se	B	Yes	No	C	.0040	BSb	.0020	SI	No	2¼x1½	2¼x1⅜	2¼x1⅞	2¼x1⅜	2¼x1⅝	2¼x1⅜	2¼x1¾	2¼x1⅜	2¼x2⅛	83.17	38
39	Oldsmobile F-37	2⅛x1⅜	BSb	Own	.0020	.0075	No	Se	A	Yes	7	F	.0060	BSb	.0020	SI	No	2¼x1⅜	2¼x1½	2¼x1½	2¼x1¾						51.23	39
40	Oldsmobile L-37	2⅛x1⅜	BSb	Own	.0020	.0075	No	Se	A	Yes	8	F	.0060	BSb	.0020	SI	No	2¼x1⅜	2¼x1⅜	2¼x1⅞	2¼x1¾						55.29	40
41	Packard Six	2⅛x1¼	Bab		.0015	.0045	No	Se	B	Yes	Yes	1	.0055	BSb	.002	SI	No	2¼x1.588	2¼x1⅜	2¼x1⅜	2¼x2⅛						36.16	41
42	Packard 120-C	2⅛x1¼	Bab		.0015	.007	No	Se	B	Yes	Yes	C	.0055	BSb	.002	SI	No	2¼x1⅜	2¼x1⅜	2¼x1⅜	2¼x2¼						56.60	42
43	Packard Super Eight	2⅛x1⅜	Cla		.0015	.0045	No	Se	B	Yes	Yes	7	.0055	BSb	.0015	SI	No	2⅝x2⅛	2⅝x1⅛	2⅝x1⅝	2⅝x1¾	2⅝x1⅛	2⅝x1⅝	2⅝x1⅝	2⅝x1⅛	2⅝x2⅛	66.55	43
44	Packard Twelve	2½x1⅜	Cla		.0012	.0090	No	Se		Yes	Yes	1	.0055	BSb	.0015		No	2¾x2⅛	2¾x1¾	2¾x1¾	2¾x2⅛						44.55	44
45	Pierce-Arrow 1701	2.25x1.25	Bab		.0017	.0050	No	Sp	A	Yes	16	F	.0030	BBb	.0022	SI	No	2⅝x1¾	2⅝x1⅛	2⅝x1⅝	2⅝x1⅛	2⅝x1¾	2⅝x1⅛	2⅝x1⅝	2⅝x1⅛	2⅝x2⅛	99.20	45
46	Pierce-Arrow 1702	2.12x1.12	Bab		.0017	.0075	No	Sp	A	Yes	12	F	.0030	BBb	.0022	SI	No	2½x1¾	2½x1¼	2½x1¼	2½x1⅞	2½x1¼	2½x1¼	2½x3.473			94.78	46
47	Pierce-Arrow 1703	2.12x1.12	Bab		.0017	.0075	No	Sp	A	Yes	12	F	.0030	BBb	.0022	SI	No	2½x1¾	2½x1¼	2½x1¼	2½x1⅞	2½x1¼	2½x1¼	2½x3.473			94.78	47
48	Plymouth P-3	1⅛x1	BSb		.0015	.0085	No	Se		No	Yes	R	.005	BSb	.0015	SI	No	2¼x1⅛	2¼x1⅛	2¼x1⅛	2¼x1⅞						36.60	48
49	Plymouth P-4	1⅛x1	BSb		.0015	.0085	No	Se		No	Yes	R	.005	BSb	.0015	SI	No	2¼x1⅛	2¼x1⅛	2¼x1⅛	2¼x1⅞						36.60	49
50	Pontiac De Luxe Six 37-26 CA	2x1⅛	BSb	Own	.0010	.0075	No	Se	A	Yes	Yes	RC	.0055	BSb	.0020	SI	No	2⅜x1⅛	2⅜x1⅛	2⅜x1⅛	2⅜x2						13.50	50
51	Pontiac De L. Eight 37-28CA	2x1⅛	BSb	Own		.0075	No	Se	A	Yes	Yes	RC	.0055	BSb	.0020	SI	No	2⅜x1⅛	2⅜x1⅛	2⅜x1⅛	2⅜x1.375	2⅜x2					16.30	51
52	Studebaker Dict. & Dict. Pl. 6	2⅜x1⅜	Bab	Own	.0012	.007	No	Sp	A	Yes	Yes	1	.0045	BSb	.0015	SI	No	2½x1⅛	2½x1⅛	2½x1⅛	2½x1⅜						13.52	52
53	Studebaker President	1⅞x1⅜	Cle	CGB	.0017	.0075	No	Se	A	Yes	Yes	1	.0045	BSb	.0020	SI	No	2⅛x⅞	2⅛x⅞	2⅛x⅞	2⅛x1	2⅛x1⅛	2⅛x⅞	2⅛x⅞	2⅛x⅞	2⅛x1⅛	21.00	53
54	Terraplane 71	1.937x1.375	BSp	Own	.001	.008	Lam	Sp	A	Yes	Yes	C	.009	BBb	.0010	In	Lam	2.343x1.625	2.375x1.750	2.406x2.375							42.96	54
55	Terraplane 72	1.937x1.375	BSp	Own	.001	.008	Lam	Sp	A	Yes	Yes	C	.009	BBb	.0010	In	Lam	2.343x1.625	2.375x1.750	2.406x2.375							42.96	55
56	Willys 37	1⅛x1⅛	BSp	Own	.0015	.007	No	Sp	A	No	No	F	.005	BSb	.0015	SI	No	2.334x2.00	2.334x2.00	2.334x1⅛							38.04	56

*—Maximum
(a)—No. 93 High Chromium or No. 1 Silichrome
A—Above

ABBREVIATIONS:

Amp—Amplex
B—Below
Bab—Babbitt
BBb—Babbitt Bronze Backed
BSb—Babbitt Steel Backed
B-Sp—Babbitt Spun
C—Center
CGB—Cleveland Graphite Bronze Co.
Cla—Copper Lead Alloy
Cle—Clevite
CS-Sb—Cadmium Silver-Steel Backed
F—Front
In—Integral with Case and Cap
Lam—Laminated
Lan—Lanchester Type
R—Rear
RC—Rear Center
Se—Separate
SI—Slip in Type
So—Solid
Sp—Spun

VALVES—INTAKE AND EXHAUST

Line Number	CAR MAKE AND MODEL	Arrangement	INTAKE VALVE: Make	Head: Material	Head: Diameter	Seat: Angle (Deg.)	Seat: How Cooled	Stem: Material	Stem: Length (Ins.)	Stem: Diameter (Ins.)	Stem: End Style	Stem to Guide Clearance (Ins.) Average	Lift (Ins.)	Springs: Valve Open: Pressure (Average)	Springs: Valve Open: Length	Springs: Valve Closed: Pressure (Average)	Springs: Valve Closed: Length	EXHAUST VALVE: Make	Head: Material	Head: Diameter	Seat: Angle (Deg.)	Seat: How Cooled	Stem: Material	Stem: Length (Ins.)	Stem: Diameter (Ins.)	Stem: End Style	Stem to Guide Clearance (Ins.) (Average)	Lift (Ins.)	Springs: Valve Open: Pressure (Average)	Springs: Valve Open: Length	Springs: Valve Closed: Pressure (Average)	Springs: Valve Closed: Length	Line Number
1	American-Bantam			CNS				CNS											Silc					Silc									1
2	Auburn 654	L	Tmp	3140	1 3/16	30		3140	5 1/4	.342			5/16	88	1 31/32	47	2 1/16	Tmp	Silc	1 1/16	45		Silc	5 1/4	.342			5/16	88	1 31/32	47	2 1/16	2
3	Auburn 852	L	Tmp	3140	1 3/16	30		3140	5 1/4	.342			5/16	88	1 31/32	47	2 1/16	Tmp	Silc	1 1/16	45		Silc	5 1/4	.342			5/16	88	1 31/32	47	2 1/16	3
4	Auburn SC-852	L	Tmp	3140	1 3/16	30		3140	5 1/4	.342			5/16	88	1 31/32	47	2 1/16	Tmp	Silc	1 1/16	45		Silc	5 1/4	.342			5/16	88	1 31/32	47	2 1/16	4
5	Buick 37-40	I	Tmp	NC	1 11/32	45	WC	NC	4 1/8	.371	G	.0025	.348	118‡	(f)	47‡	(g)	Tmp	Silc	1 1/32	45	WC	Silc-C	4 1/8	.3715	G	.0030	.342	118‡	(f)	47‡	(g)	5
6	Buick 37-60	I	Tmp	NC	1 11/32	45	WC	NC	4 5/16	.371	G	.0025	.347	118‡	(f)	47‡	(g)	Tmp	Silc	1 1/32	45	WC	Silc-C	4 1/8	.3715	G	.0030	.348	118	(f)	47‡	(g)	6
7	Buick 37-80	I	Tmp	NC	1 11/32	45	WC	NC	4 5/16	.371	G	.0025	.347	118‡	(f)	47‡	(g)	Tmp	Silc	1 1/32	45	WC	Silc-C	4 1/8	.3715	G	.0030	.348	118	(f)	47‡	(g)	7
8	Buick 37-90	I	Tmp	NC	1 11/32	45	WC	NC	4 5/16	.371	G	.0025	.347	118‡	(f)	47‡	(g)	Tmp	Silc	1 1/32	45	WC	Silc-C	4 1/8	.3715	G	.0030	.348	118	(f)	47‡	(g)	8
9	Cadillac V8-60	L	WR	3140	1.87	45	WC	3140	5 11/32	.342		.0023	.335	145	1.58	66	1.92	WR	3140	1.62	45	WC	3140	5 11/32	.341		.0033	.345	145	1.58	66	1.92	9
10	Cadillac V8-65	L	WR	3140	1.87	45	WC	3140	5 11/32	.342		.0023	.335	145	1.58	66	1.92	WR	3140	1.62	45	WC	3140	5 11/32	.341		.0033	.345	145	1.58	66	1.92	10
11	Cadillac V8-70	L	WR	3140	1.87	45	WC	3140	5 11/32	.342		.0023	.335	145	1.58	66	1.92	WR	3140	1.62	45	WC	3140	5 11/32	.341		.0033	.345	145	1.58	66	1.92	11
12	Cadillac V8-75	L	WR	3140	1.87	45	WC	3140	5 11/32	.342		.0023	.335	145	1.58	66	1.92	WR	3140	1.62	45	WC	3140	5 11/32	.341		.0033	.345	145	1.58	66	1.92	12
13	Cadillac V12-85	I	WR	3140	1.51	45	WC	3140	6.22	.339		.0015	.347	(b)	(b)	(c)	(c)	WR	3140	1.38	45	WC	3140	6.22	.339		.0025	.347	(b)	(b)	(c)	(c)	13
14	Cadillac V16-90	I	WR	3140	1.51	45	WC	3140	6.22	.339		.0015	.347	(b)	(b)	(c)	(c)	WR	3140	1.38	45	WC	3140	6.22	.339		.0025	.347	(b)	(b)	(c)	(c)	14
15	Chevrolet Master	I	Own	ExSt	1 11/32	30	WC	ExSt	6 1/16	.341	G	.0020	1/4	98	1 1/16	45	1 7/16	Own	ExSt	1 1/32	30	Sp	ExSt	4 1/16	.340	G	.0030	1/4	98	1 1/16	45	1 7/16	15
16	Chevrolet Master De Luxe	I	Own	ExSt	1 11/32	30	WC	ExSt	6 1/16	.341	G	.0020	1/4	98	1 1/16	45	1 7/16	Own	ExSt	1 1/32	30	Sp	ExSt	4 1/16	.340	G	.0030	1/4	98	1 1/16	45	1 7/16	16
17	Chrysler Royal C-16	L	Tmp	CNS	1 11/32	45		CNS	4 13/16	.3405	G	.002	11/32	105		42 1/2		Tmp	Silc	1 1/32	45		Silc	4 13/16	.3405	G	.004	11/32	105		42 1/2		17
18	Chrysler Imperial C-14	L	Tmp	CNS	1 11/32	45		CNS	5 1/16	.3405	G	.002	11/32	107		48		Tmp	Silc	1 1/32	45		Silc	5 1/16	.3405	G	.002	11/32	107		48		18
19	Chrysler Custom Imperial C-15	L	Tmp	CNS	1 11/32	45		CNS	5 1/16	.3405	G	.002	11/32	107		48		Tmp	Silc	1 1/32	45		Silc	5 1/16	.3405	G	.002	11/32	107		48		19
20	Chrysler Airflow C-17	L	Tmp	CNS	1 11/32	45		CNS	5 1/16	.3405	G	.002	11/32	107		48		Tmp	Silc	1 1/32	45		Silc	5 1/16	.3405	G	.002	11/32	107		48		20
21	Cord Front Drive 812	L	Tmp	3140	1 11/32	30	WC	3140	5 11/16	.3425	G	.002	11/32	122	1 11/32	59 1/2	2 1/16	Tmp	Silc	1 1/32	45	WC	Silc	5	.3425	G	.002	11/32	122	1 11/32	59 1/2	2 1/16	21
22	Cord S-3	L	Tmp	CNS	1 11/32	45		CNS	4 13/16	.3405	G	.002	11/32	105		42 1/2		Tmp	Silc	1 1/32	45		Silc	4 13/16	.3405	G	.002	11/32	105		42 1/2		22
23	De Soto D-5	L	Tmp	CNS	1 11/32	45		CNS	4 13/16	.3405	G	.002	1/4	80		36		Tmp	Silc	1 1/32	45		Silc	4 13/16	.3405	G	.004	1/4	80		36		23
24	Dodge 8	OC	Tmp	CNS	1 1/2	30		CNS	5.0	11/32			.360	(d)	(d)		(e)	Tmp	Silc	1 1/16	30		Silc	5.0	11/32			.360	(d)	(d)		(e)	24
25	Duesenberg																		1.281	45													25
26	Ford V8-60	L		CNS	1.231	45				.2785		.0025		50		28			1.537	45					.3105		.0025		64		34			26
27	Ford V8-85	L		CNS	1.537	45				.3105		.0025		64		34																	27
28	Graham Crusader 85	L		CNS	1 23/32	30	WC	CNS		5/16	Dr	.0018	5/16	87		34		Tmp	Silc	1 1/16	45	WC	Silc		5/16	Dr	.0028	5/16	87		34		28
29	Graham Cavalier 95	L		CNS	1 23/32	30	WC	CNS		5/16	Dr	.0018	5/16	87		34		Tmp	XCR	1 1/16	45	WC	XCR		5/16	Dr	.0028	5/16	87		34		29
29	Graham Supercharger 116	L		CNS	1 23/32	30	WC	CNS	4 7/8	5/16	Dr	.0018	5/16	87		34		Tmp	XCR	1 1/16	45	WC	XCR	4 7/8	5/16	Dr	.0028	5/16	87		34		30
30	Graham Supercharger 120	L		CNS	1 23/32	30	WC	CNS	4 7/8	5/16	Dr	.0018	5/16	87		34		Tmp	XCR	1 1/16	45	WC	XCR	4 7/8	5/16	Dr	.0028	5/16	87		34		31
31	Hudson 73	L	WR	Silc	1.375	45	WC	3140	5.343	.375	G	.0022	.343	102	1.656	44	2.00	WR	Silc	1.375	45	WC	Silc	5.343	.375	G	.004	.343	102	1.656	44	2.00	32
32	Hudson 74-5-6-7	L	WR	Silc	1.50	45	WC	3140	5.093	.375	G	.0022	.343	102	1.656	44	2.00	WR	Silc	1.375	45	WC	Silc	5.093	.375	G	.004	.343	102	1.656	44	2.00	33
33	La Salle 37-50	L	WR	3140	1.87	45	WC	3140	5 11/32	.341		.0023	.335	145	1.581	66	1.92	WR	3140	1.62	45	WC	3140	5 11/32	.3411		.0033	.345	145	1.58	66	1.92	34
34	Lincoln Zephyr			CNS	1.53	45				.311								CNS	1.53	45					.311								35
35	Lincoln V-12																																36
36	Nash Lafayette 400-3710	L		CN	1 11/32	45	WC	CN			G	.0030	1/4						CNSi	1 11/32	45	WC	CNSi			G	.0030	1/4					37
37	Nash Ambassador 8-3720	I	WR	CN	1.75	45	WC	CN	5 11/32	.372	G	.0030	11/32					WR	CNSi	1.59	45	WC	CNSi	5 11/32	.372	G	.0030	11/32					38
38	Nash Ambassador 8-3780	I	WR	3140	1.65	45	WC	3140	5 11/32	.372	G	.0030	11/32					WR	CNSi	1.46	45	WC	CNSi	5 11/32	.372	G	.0030	11/32					39
39	Oldsmobile F-37	L	Tmp	3140	1 3/16	30	WC	3140	5 11/32	11/32	G	.0022	1/4	94	1 11/32	46	2 1/16	Tmp	Silc	1 1/32	45	WC	Silc	5 11/32	11/32	G	.0032	1/4	94	1 11/32	46	2 1/16	40
40	Oldsmobile L-37	L	Tmp	3140	1 3/16	30	WC	3140	5 11/32	11/32	G	.0022	1/4	94	1 11/32	46	2 1/16	Tmp	Silc	1 1/32	45	WC	Silc	5 11/32	11/32	G	.0032	1/4	94	1 11/32	46	2 1/16	41
41	Packard Six	L		CNS	1.57	30		CNS	5 5/8	.340	SK	.0001	.300	110	1 1/8	40	1 5/8		Aus	1.406	45		Aus	5 5/8	.340	SK	.0001	.300	110	1 1/8	40	1 5/8	42
42	Packard 120-C	L		CNS	1 11/32	30		CNS	5 5/8	.340	SK	.0001	.300	110	1 1/8	40	1 5/8		Aus	1 11/32	45		Aus	5 5/8	.340	SK	.0001	.300	110	1 1/8	40	1 5/8	43
43	Packard Super Eight	L		CNS	1 11/32	45		CNS	7 11/32	.3405	SK	.0025	.358	159		73†	3 1/16		Aus	1 11/32	45		Aus	7 11/32	.3405	SK	.004	.356	159*		73	3 1/16	44
44	Packard Twelve	ML		CNS	1 11/32	45		CNS	6 11/32	.3405	SK	.0025	.3125	145		70	2 1/16		Aus	1 11/32	45		Aus	6 11/32	.338	SK	.005	.3125	145		70	2 1/16	45
45	Pierce-Arrow 1701	L		CNS	1 11/32	45	WC	CNS	4 3/4	.373		.0020	.335	124	1 11/32	62 1/2	2 1/16		Silc	1 1/16	45	WC	Silc	4 3/4	.372		.0030	.343	124	1 11/32	62 1/2	2 1/16	46
46	Pierce-Arrow 1702	L		CNS	1 11/32	45	WC	CNS	4 3/4	.373		.0020	.324	124	1 11/32	62 1/2	2 1/16		Silc	1 1/16	45	WC	Silc	4 3/4	.372		.0030	.324	124	1 11/32	62 1/2	2 1/16	47
47	Pierce-Arrow 1703	L		CNS	1 11/32	45	WC	CNS	4 3/4	.373		.0020	.324	124	1 11/32	62 1/2	2 1/16		Silc	1 1/16	45	WC	Silc	4 3/4	.372		.0030	.324	124	1 11/32	62 1/2	2 1/16	48
48	Plymouth P-3	L	Tmp	CNS	1 11/32	45		CNS	4 11/32	.3405	G	.0020	1/4	80	1 1/16	36	1 5/16	Tmp	Silc	1 1/32	45		Silc	4 11/32	.3405	G	.004	1/4	80		36		49
49	Plymouth P-4	L	Tmp	CNS	1 11/32	45		CNS	4 11/32	.3405	G	.0020	11/32	80	1 1/16	36	1 13/32	Tmp	Silc	1 1/32	45		Silc	4 11/32	.3405	G	.004	11/32	80		36		50
50	Pontiac De Luxe Six 37-26 CA	L	Own	Silc	1 11/32	30	WC	Silc	4 11/16	.3105	W	.0006*	11/32	96	1 11/32	56	1 13/32	Own	Silc	1 1/32	45	WC	Silc	4 11/16	.3105	W	.0006*	11/32	96	1 11/32	56	1 13/32	51
51	Pontiac De Luxe Eight 37-28 CA	L	Own	Silc	1 11/32	30	WC	Silc	4 3/4	.3105	W	.0006*	11/32	96	1 11/32	56	1 13/32	Own	Silc	1 1/32	45	WC	Silc	4 3/4	.3105	W	.0006*	11/32	96	1 11/32	56	1 13/32	52
52	Studebaker Dict. & Dict. Pl. 6	L	W-D	CNS	1 11/32	45	Sp	CNS	5 1/32	11/32	G	.002	11/32	130	1 3/4	59 1/2	2 1/16	WD	(a)	1 1/32	45	Sp	(a)	5 1/32	11/32	G	.002	11/32	130	1 3/4	59 1/2	2 1/16	53
53	Studebaker President	L	W-D	CNS	1 11/32	45	WC	CNS	5 1/32	11/32	G	.002	11/32	130	1 3/4	50 1/2	2 1/16	WD	(a)	1 1/32	45	WC	(a)	5 1/32	11/32	G	.002	11/32	130	1 3/4	59 1/2	2 1/16	54
54	Terraplane 71	L	WR	3140	1.375	45	WC	3140	5.343	.375	G	.0022	.343	102	1.656	44	2.0	WR	Silc	1.375	45	WC	Silc	5.343	.375	G	.004	.343	102	1.656	44	2.0	55
55	Terraplane 72	L	WR	3140	1.375	45	WC	3140	5.343	.375	G	.0022	.343	102	1.656	44	2.0	WR	Silc	1.375	45	WC	Silc	5.343	.375	G	.004	.343	102	1.656	44	2.0	56
56	Willys 37	L	WR	CNS	1 11/32	45	WC	CNS	5 1/4	.372		.0030	11/32	85 1/2	1 11/16	46 1/2	2 1/4	WR	(a)	1 11/32	45	WC	(a)	5 1/4	.371		.004	11/32	85 1/2	1 11/16	46 1/2	2 1/4	56

ABBREVIATIONS

†—Dual Springs
‡—Total—Dual Springs
†—Minimum
(a)—Wilcox Rich-Silic. No. 1 or Detroit R4
Aus—Austenitic Steel
(b)—Outer—115¼ lbs. @ 1.578
—Inner—51¼ lbs. @ 1.407
(c)—Outer—50 lbs. @ 1.922
—Inner—19½ lbs. @ 1.751
CNS—Chrome Nickel Steel
CNSi—Chrome Nickel-Silicon Steel
(d)—Outer—65 lbs. @ 1 11/16
—Inner 37 lbs. @ 1 11/16
DR—Drilled for Pin
(e)—Inner 2 11/32—outer 2¼ free length
ExSt—Extruded Steel
(f)—Inner 1 1/16—outer 1 11/16
(g)—Inner 1 1/16—outer 1 11/16
G—Grooved
Han—Handy
I—In Head
L—Ell Head
ML—Modified Ell Head
NC—Nickel Chromium
OC—Overhead Camshaft
Silc—Silichrome
Silc-C—Silichrome Copper Plated
SK—Slot and Key
Sp—Spray
Th—Thermostatic
Tmp—Thompson Products
W—Wedge Type
WC—Water Circulation
WD—Wilcox Rich or Detroit
WR—Wilcox Rich
XCR—Thompson XCR Steel

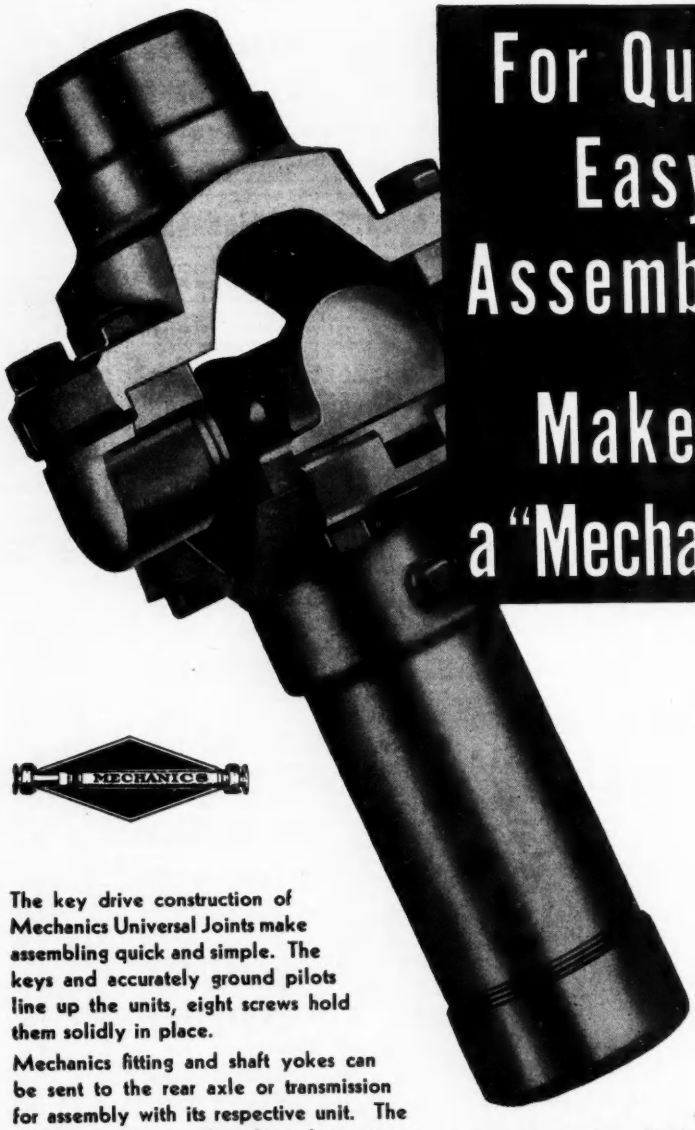
Tractor Axle

(Continued from page 719)

in regular cultivation, the wheeled conversion unit will generally serve, particularly since the traction wheels can be equipped with tractor-type pneumatic tires.

As an example of the work that can be done with passenger cars converted for tractor use by means of these units, the manufacturer states that a 4/16 hp. Opel car (61 cu. in. displacement) when equipped with the wheeled conversion unit with single pneumatic tires, and geared 5:1, developed a drawbar pull of 750 lb. when the load on the driving axle was 1625 lb. and 1020 lb. when the driving-axle load was increased to 2150 lb. The tractor readily pulled a single-bottom plow plowing to a depth of 8 in. and hauled a load trailer with a gross weight of 17,500 lb. at a speed of about 7.5 m.p.h.

It is claimed that the conversion unit can be put on or taken off by one man in 15 minutes, so that the motor vehicle is available for tractor work as well as for its normal purpose.



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The key drive construction of Mechanics Universal Joints make assembling quick and simple. The keys and accurately ground pilots line up the units, eight screws hold them solidly in place.

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MECHANICS UNIVERSAL JOINT DIVISION
Borg-Warner Corp. 1301 18th AVE., ROCKFORD, ILLINOIS

Engineering Alloys

Engineering Alloys—Names, Properties, Uses. By Norman E. Woldman, Ph. D., and Albert J. Dornblatt. Published by the American Society for Metals, Cleveland, Ohio.

THIS is essentially a compilation and is presented as including practically all proprietary commercial and technical alloys manufactured in the United States and many alloys manufactured in foreign countries, particularly England, France, Germany and Sweden. The book is divided into seven sections. Section I is an alphabetical list of all of the alloys, with an index or serial number for each. Section II gives the trade name, composition, properties, uses, general remarks and a key number designating the manufacturer and the reference for each alloy as listed in serial order. Section III is an index of alloys classified according to typical uses or special characteristics, such as resistance to corrosion. Section IV is an alphabetical list of manufacturers with a summary of the alloys listed that are produced by each. Section V is a list of manufacturers with their addresses, in serial order according to the key number. Section VI comprises the references in serial order according to their key number, and Section VII is an appendix of useful tables and general metallurgical information.

Physical Properties of Steel

The Steel Physical Properties Atlas. By C. N. Dawe. Published by the Society for Metals, Cleveland, Ohio.

THIS atlas contains on facing pages a chart of physical properties of a particular steel and tables of the chemical composition of the steel and the heat treatment to which the test bar must be subjected to show these properties. The charts give the tensile strength, yield point, elongation, reduction of area, and Brinell hardness. The plates are of large scale and printed in colors. Charts and specifications are given for all of the S.A.E. steels, cast steels, plates and rounds, stainless steel and high-tensile steels.

Economy Test

ANOTHER 5-liter economy contest was held in France (at La Ferte-Bernard) in September. Vehicles were "classed" according to the distance they covered on a 5-liter (1.32 gallon) supply of a fuel mixture consisting of four parts of gasoline, one part of benzol and one of alcohol. The trial was held on public roads, the course being moderately hilly and containing a number of turns. The following rather remark-

able results were recorded (converted into miles per U. S. gallon): A 3-hp. vehicle, 76 miles; a 6-hp. vehicle, 58 miles; a 9-hp. vehicle, 36 miles; a 11-hp. vehicle, 38.5 miles; a 13-hp. vehicle, 31.5 miles, and a 28-hp. vehicle, 22.5 miles. The horsepowers given evidently refer to the tax horsepowers of the various vehicles.

Recommendation for Brinell Testing

AN extensive study of the Brinell method of hardness testing has been made at the Bureau of Standards and the results are given in Research Paper RP903, "Determination of the Brinell Number of Metals" by Serge N. Petrenko, Walter Ramberg and Bruce Wilson, of which copies can be obtained from the Superintendent of Documents, Washington, D. C., at 5 cents each. The following recommendations are made for tests for Brinell number on metals having a Brinell hardness of over 70:

The loading mechanism should be operated to give a uniform rate of loading not exceeding 500 kg. per sec. The maximum load should be applied for 30 seconds. The error in the load applied by the machine should not exceed one-third per cent. This should be checked by a periodic calibration with a proving ring or other suitable device. The calibration of the apparatus used for measuring the diameter of the indentation should be checked frequently. The maximum error in the reading at any point on the scale should not exceed 0.01 mm. The indentation diameter should be read in two or more mutually perpendicular directions.

If the indentation has a non-circular boundary, the Brinell number should be computed from the average of diameter readings in at least four equally-spaced directions. Care should be taken to polish the surface of the specimen to such a finish that the error in the diameter reading due to tool marks does not exceed 0.01 mm. If the indentation is made on a curved specimen, the minimum radius of curvature of the specimen should not be less than 25 mm. for a 10-mm. ball. The diameter of the indentation should be taken as the average of the two principal diameters. The specimen should be at least 0.4 in. thick. The distance of the center of indentation from the edge of the specimen should be at least three times the diameter of the indentation. The distance between centers of adjacent indentations should be at least three times the diameter of indentation. The angle between the load line and the normal to the specimen should not exceed 2 deg.

The difference between the average diameter and the nominal (10 mm.) diameter of the ball should not exceed 0.025 mm. (0.001 in.). The average diameter should be the average of six or more different diameters of the ball. The difference between any individual diameter and the average diameter of new balls should not exceed 0.025 mm. (0.001 in.). The material of the indenting ball (e.g., steel, Carboloy, diamond) must be specified when quoting Brinell numbers of over 500. The permanent compression of the loaded diameter of the ball after any indentation on a specimen having a Brinell number less than 500 should not exceed 0.01 mm. If, however, steel balls are used on specimens having Brinell numbers greater than 500, the permanent compression after any indentation should not exceed 0.025 mm. The use of Carboloy balls is recommended for identations on any specimen having a Brinell number greater than 500.

HIGHEST AIR CLEANING EFFICIENCY

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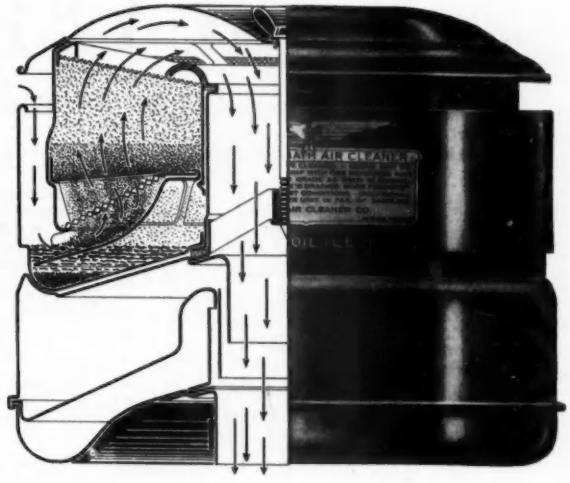
GUARANTEED PRODUCTS.

Cut-away view of United Oil Bath Cleaner and Silencer



Separator divides oil reservoir into two compartments of high and low turbulence areas; enables oil circulation to occur in filter element at wider range of carburetor throttle openings.

Application of stationary fan affords mechanical control of oil — an exclusive feature found only in a United Oil Bath air cleaner, a feature fully patented.

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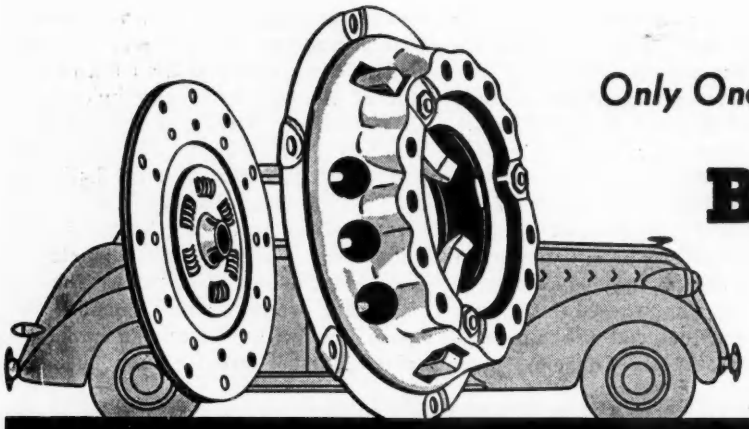
DUAL OIL CONTROL consists of application of stationary fan in filter compartment and an oil separator in oil reservoir. The fan centrifuges oil from air stream to outer wall of filter element causing quicker oil drain back and several times faster completion of oil washing cycle than in conventional type oil bath air cleaners —thus higher cleaning efficiency. Oil separator in oil reservoir provides high and low turbulence areas permits early oil wetting of filter element at small throttle openings without oil "pull-over" at maximum carburetor throttle openings. Dirt settling occurs more quickly in cleaner containing a low turbulence area—oil freer of dirt for air washing at all engine throttle openings. These two features, DUAL OIL CONTROL, provide highest cleaning efficiency.

UNITED AIR CLEANER CO.
9705 COTTAGE GROVE AVE., CHICAGO, ILL.



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See Alphabetical List of Advertisers on pages 38-39

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(Turn to page 36, please)